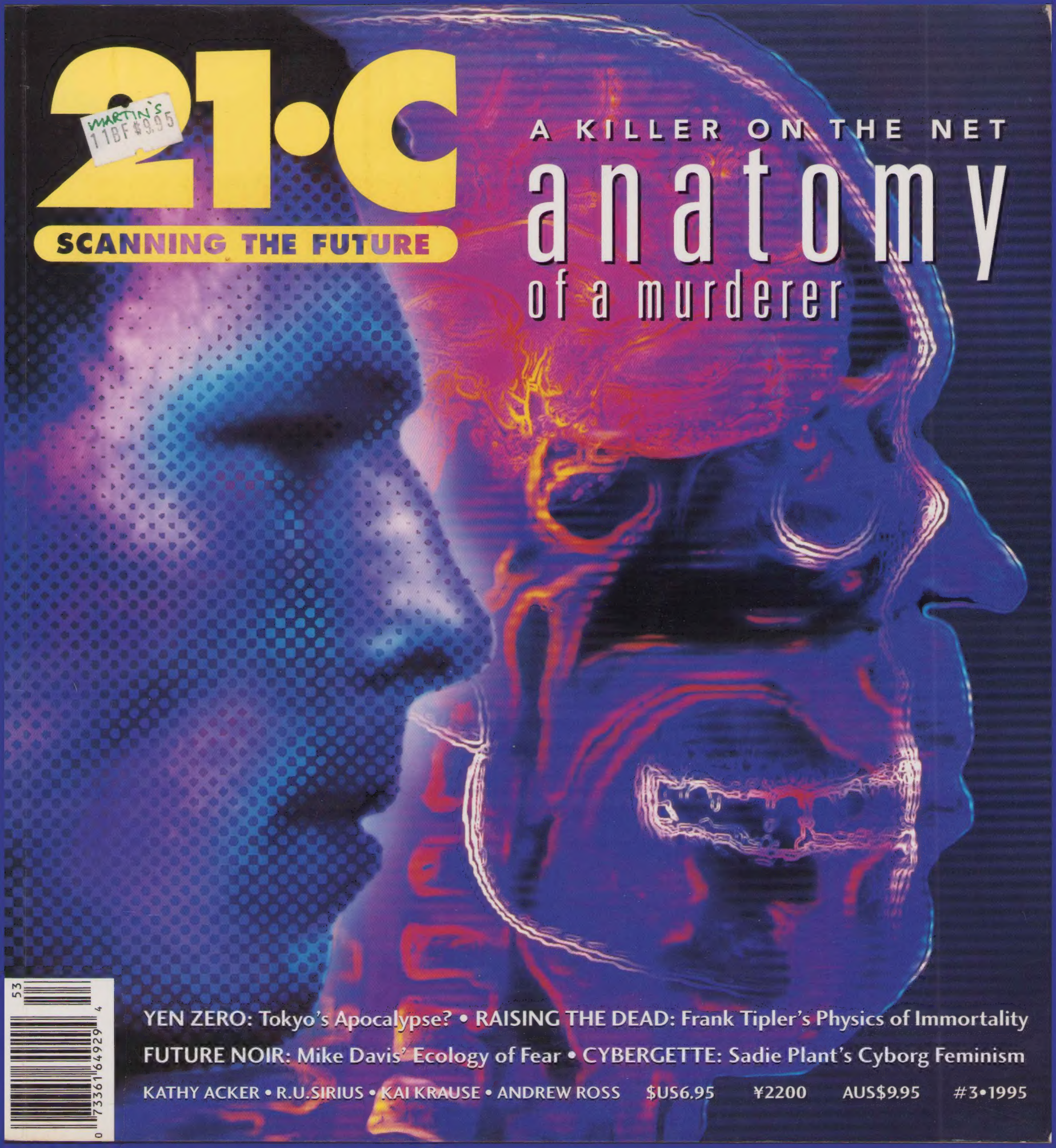
21·C

SCANNING THE FUTURE



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anatomy of a murderer

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FUTURE NOIR: Mike Davis' Ecology of Fear • CYBERGETTE: Sadie Plant's Cyborg Feminism

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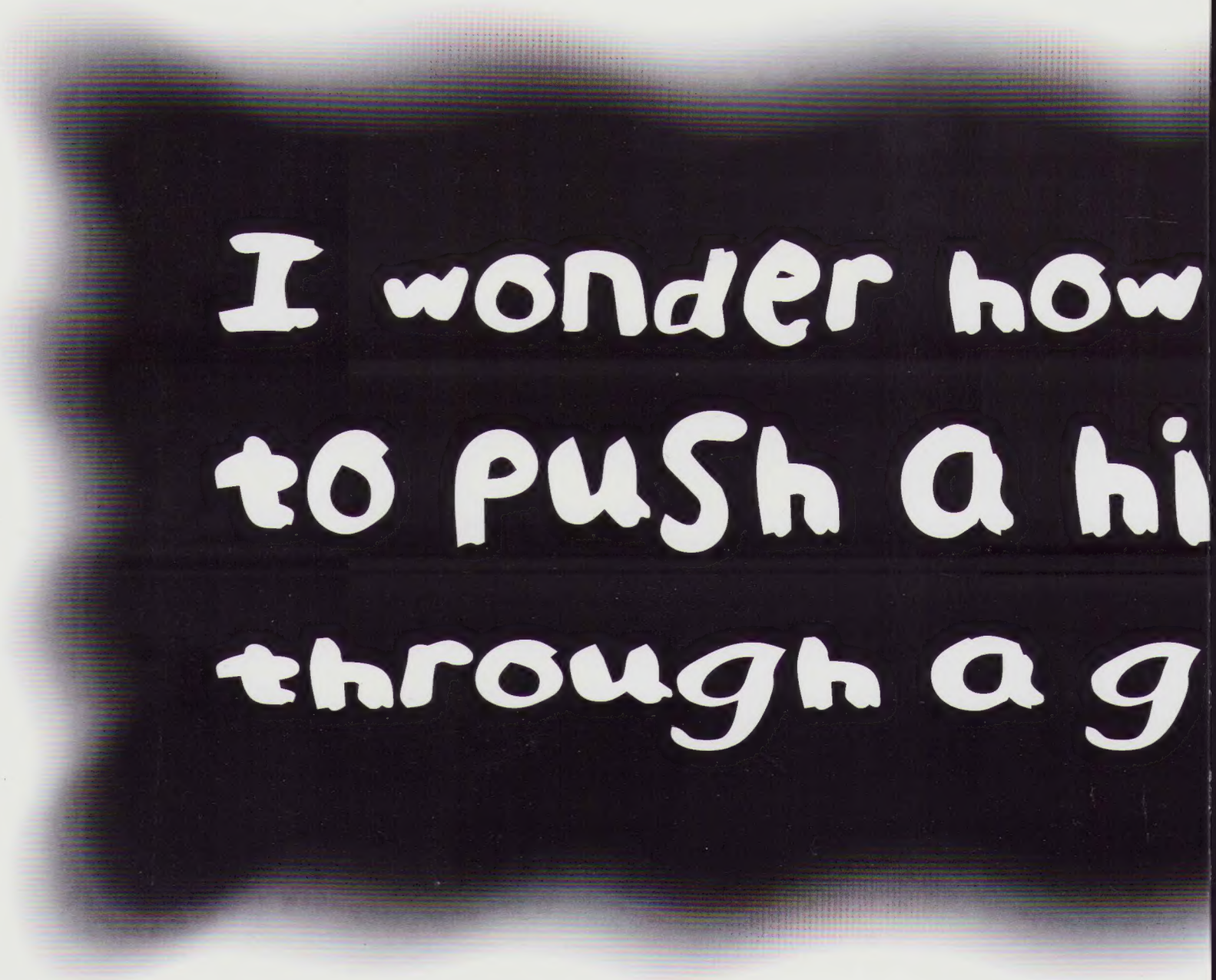

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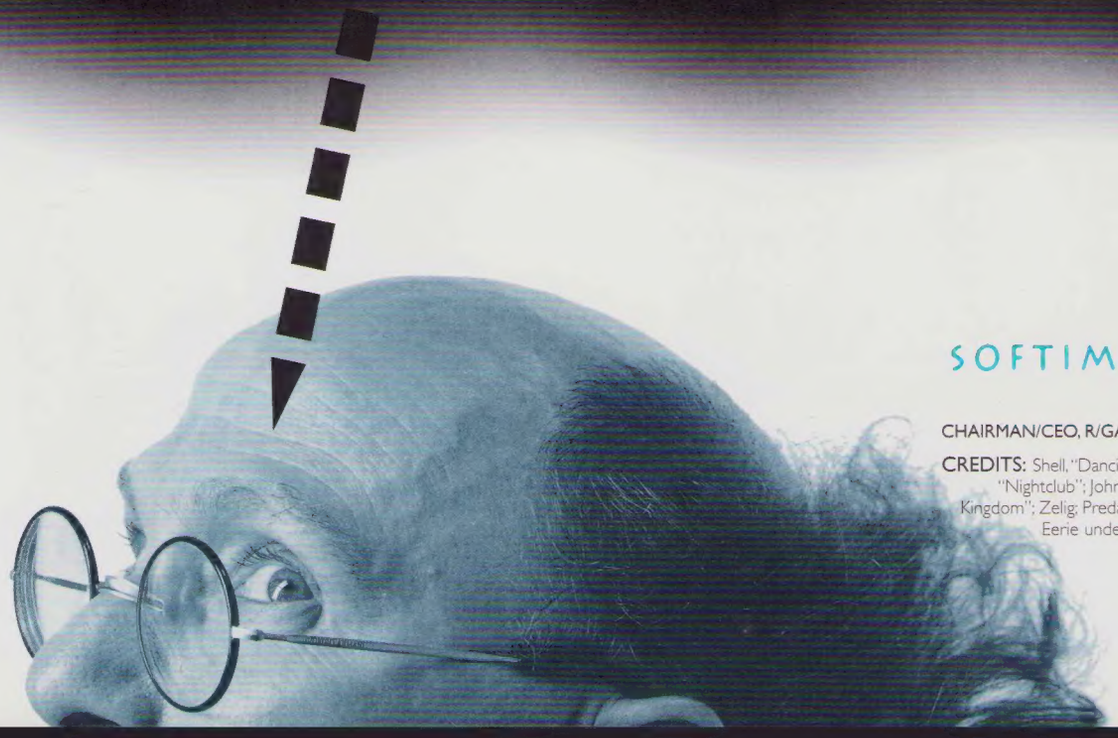

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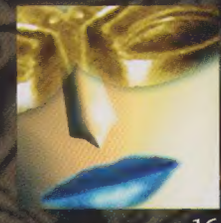

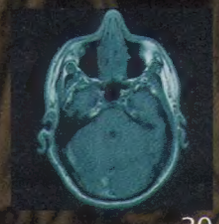

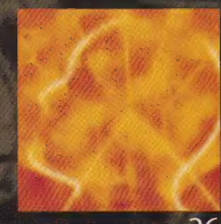

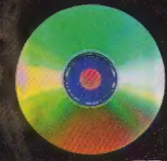

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When *21•C* set out to be on the cutting edge of ideas affecting the future, it was impossible to predict how fine those cuts would be.

But Joseph Paul Jernigan found out when he signed not just his life, but his body, away with a cold blooded murder and an organ donor card. Jernigan became the first subject of the National Library of Medicine's Visible Human Project, with the net result being that he was cut into 1,871 fine slices, each of which was photographically rendered onto the Internet for the use of students, doctors and voyeurs.

The 'operation,' which followed Jernigan's execution via an injection of barbiturates, reveals one side of the remarkable information resource that the Net has become. It also raises some serious ethical dilemmas. Would Jernigan approve of such use for his body, a use of which he had no prior knowledge? David Ellison considers the implications in "Anatomy of a Murderer" (page 20).

Such moral issues hover around most decisions taken which will effect the future. One area, covered extensively in this issue, is the structure of cities, and the power behind them. Mike Davis, author of *City of Quartz* and one of the world's leading writers in this field, outlines his vision of a future Los Angeles to Mark Dery in "Future Noir" (page 42). It's a chilling and bleak vision, dominated by what Davis has termed an "ecology of fear."

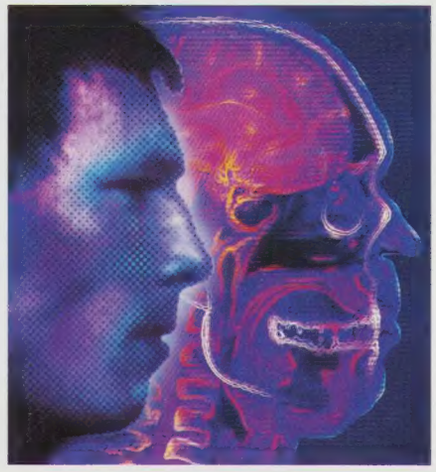
Of equal concern are issues raised by Adam L.Penenberg as he considers the fate of the Japanese people, and the world's finances, should 'the great quake' hit an ill-prepared Tokyo.

However if physicist Frank Tipler is to be believed, such concerns are moot. He claims to have the mathematical proof for immortality, where Paul Jernigan and the citizens of Tokyo will be reunited as parts of a vast, cosmic computer ("The Omega Man," page 26).

As always, *21•C* gathers together leading readers of the future: writer Kathy Acker on getting kicked off the Net; Dr Sadie Plant on "cybergettes"; Survival Research Laboratories' Mark Pauline, and Manuel de Landa, author of *War in the Age of Intelligent Machines*, discuss machine intelligence; while cultural theorist Andrew Ross blasts away at the underlying values of the new Right. This issue also introduces a new columnist to *21•C*; R.U.Sirius. His piece should assure some heat down the wires. We hope that our new Web site > http://www.21C.com.au < witnesses some of it.

All arguments welcome.

Ashley Crawford **Ray Edgar**



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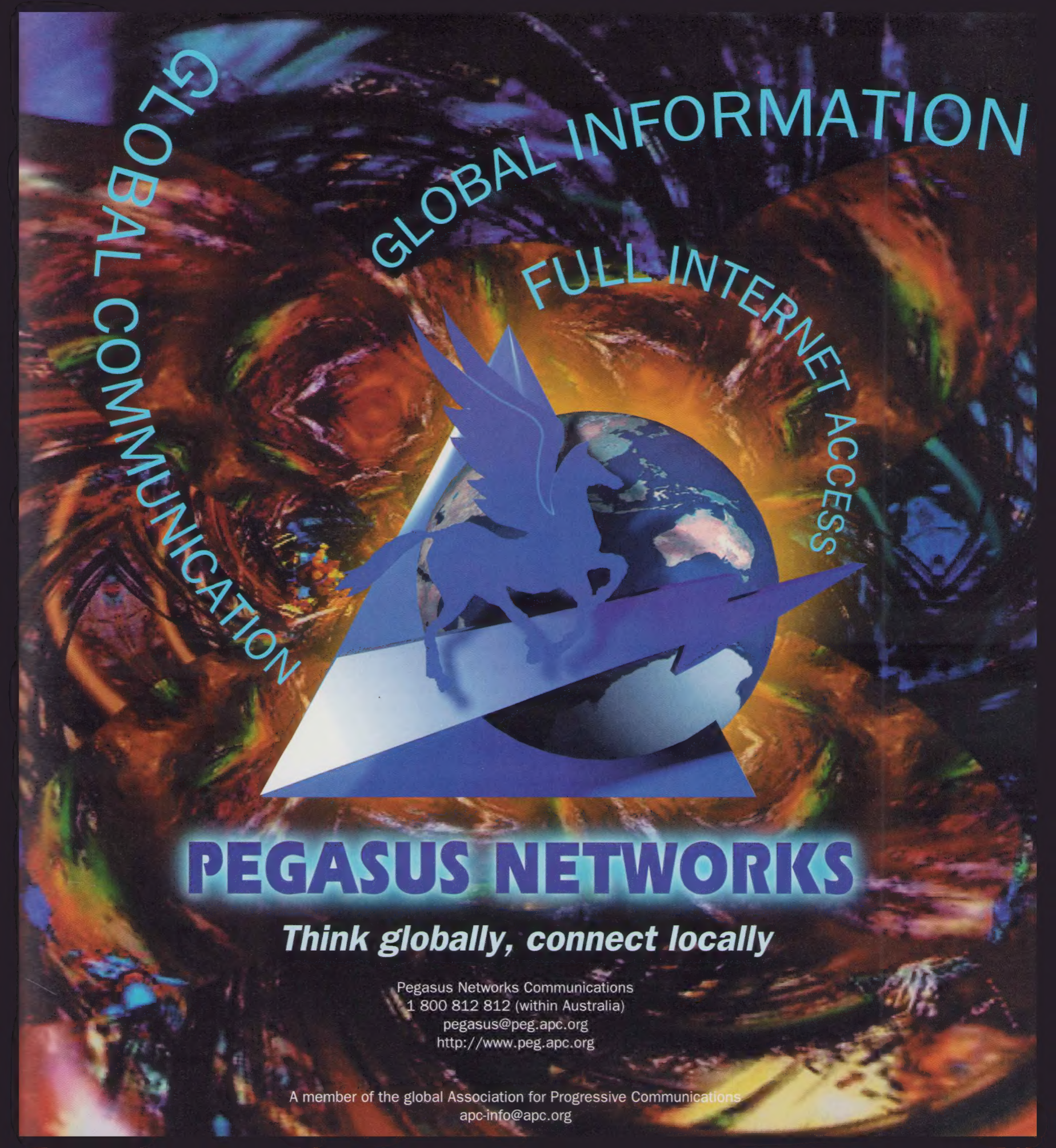
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mind games

BY FRED HARDEN

My father celebrated his 80th birthday a few days ago. The family gathered for the occasion and old friends traveled from the country to share in the event. There was lots of noise and grandchildren, and my father seemed pleased at the fuss made over him. At times he greeted someone by the wrong name, but we expected that, and everyone helped him out. Some of the changed-by-age faces confused even me, but it must have been much harder for my father. He had to recognize them from their voices because he is, as the term goes, legally blind. It's the end of a long process of declining eyesight that started 10 years ago. It began with detached retinas, which were stapled back a number of times, welded with scar tissue, burnt in by bursts of laser light. Then over time the small patches of peripheral vision became more blurred until rapidly he was reduced to being able to detect only the shapes of lighted doorways and shadowy figures in front of them.

In the last few months, however, my father began to see things again. Clearly. It began with questions about who was the person sitting in the empty chair opposite him? Had they left the door open? Was that the cat by his feet? In the dark he could see insects in his cupboard, and he was worried they were crawling on his food. Then the builders came. Working only at night, they removed the roof, leaving open holes he could see through while they re-arranged the walls and began building another house on top. He presumed it must be for the young family who often stood silently in front of him. He talked a lot about it, said they were very polite and that they talked with him but didn't seem to use their mouths.

We knew then, that it wasn't just confusing voices and shadowed shapes, my father was really seeing things.

But the psychologists who had long talks with him, claimed he was perfectly lucid. While my family were distressed, I was hundreds of miles away, and coming from the Oliver Sacks School of Pop Physiology, I knew he'd discovered something special.

Crossing from dream into waking without visual reference to reality, he'd begun to carry his dreams into the day. With the shadows and light patches flashing electric signals to an imaginative brain, he'd see people, cats and very small magpies where there were none. Pressed, he would admit that they couldn't be there, but he said that they must be, because he could see them.

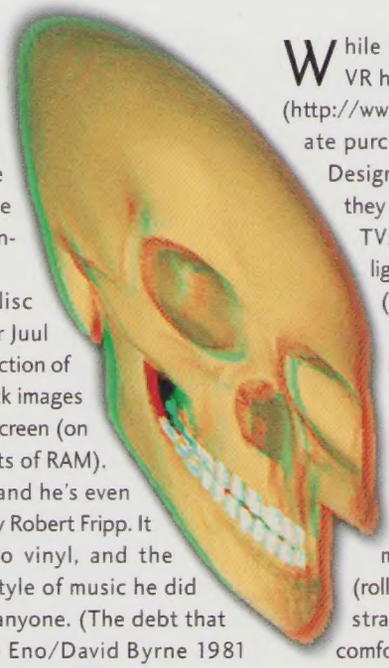
FLASHBACK: Head expansion CD-ROM courtesy of *Head Candy* and Eno/Fripp soundtrack. The trippy images are only available for Macs and, ideally, Power Macs with lots of RAM.

In short, and to bring a Pleasure Dome point to all this, my father is doing something we sighted people spend a lot of time and money trying to achieve in other ways mental, physical, chemical and technological. Trying to see things outside the mundane and everyday.

Confusing the right and left eye signals with red and blue filtered anaglyphic glasses, is one of the easiest ways to fool your trusting brain. The filters cancel each other out, and the two-dimensional superimposed views in front of it have a third dimension. *Voila*! It must have depth because I can see it. The process is used in *3-D Body Adventure* from Knowledge Adventure, a CD-ROM which brings a TV soap, emergency ward approach to learning about the human body. The medical database is thorough, covering most ways the body can crack up. The best bit is when you put on the glasses and switch to 3-D view. Then you can manipulate parts of a roughly rendered body in 3-D space, just with mouse movements. The skeleton hand opening and closing is particularly well done, and you can rotate and view from any angle an eyeball, head, brain and foot in 3-D. The lack of any depth in the medical content is made up for by some clever programming, but essentially this is parlor-game stuff. The 3-D image works best when it's you in front of the screen navigating, although it comes with two sets of cardboard glasses so you can explore intestines with a friend.

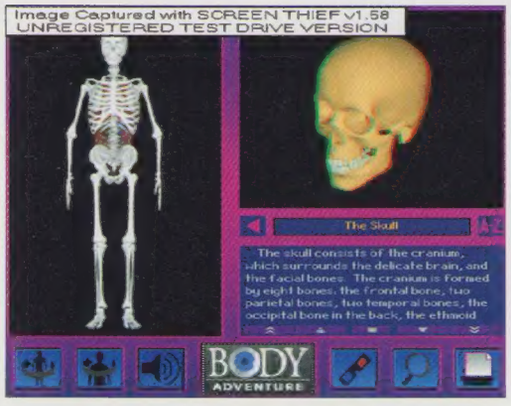
SEE FOOD: Brian Eno's *Head Candy* cardboard-framed diffraction glasses (above) come with the Mac-only disc containing trippy images. Or Virtual I-O glasses (below right) with their LCD screens with 180,000 pixel array give the impression of working at giant monitors for that extra big menu.

Staring at Brian Eno's *Head Candy* with the cardboard-framed, diffraction-grating glasses pressing into my ears was not the fully immersive experience that would induce much contemplative thought.



This is a Mac-only disc produced by Christopher Juul and Douglas Jipson. A collection of trippy and hippy throwback images that run sometimes in full screen (on a good Power Mac with lots of RAM). The music is classic Eno and he's even helped out on two tracks by Robert Fripp. It sent me back to my Eno vinyl, and the Ambient series discs, a style of music he did more to popularize than anyone. (The debt that modern Rap owes to the Eno/David Byrne 1981 collaboration *My Life in the Bush of Ghosts* is another story.) Maybe this is another of Eno's Minimalist art experiments, this time in marketing multimedia, because I suspect that other than supplying the music, he had very little to do with this CD-ROM at all.

EXQUISITE CORPSES: Knowledge Adventure's medical 3D-ROM, *Body Adventure* (above and below), allows you to manipulate parts of the human body – essentially parlor game stuff.
MINDLAB MANDALA: LED .meditation (far right)



While we are waiting for the first consumer VR helmet, the Internet Shopping Network (http://www.internet.net) has available for immediate purchase the Virtual-Viewing Video Glasses. Designed for use with PCs with VGA graphics, they can also be used with straight video from TVs, VCRs and console videogames. Ultra-light weight (only 8 ounces) the Virtual I-O (they call them i-glasses) have two small LCD screens each with an 180,000 pixel array. This gives the impression of working at an 80 inch giant monitor. There are hi-fi speakers built into the frames (20 to 20,000 Hz). Used with the 3-D computer games supplied, they feature motion sensors that can detect left/right movement (yaw), up/down (pitch) or tilt (roll). There's a clip-on visor that cuts out the stray light for a VR experience, and they fit comfortably over eyeglasses. A cheaper version just for video viewing is also available.

A different virtual world experience surfaced at a communications conference recently, where I saw a demonstration by UB Technologies of their Internet 3-D interface. UB are a big U.S. network solution's company and their forward thinking and R&D money is betting that the current generation of kids, immersed in a computer games culture, won't want their computer interface to sit flat.

UB Technologies believe that all the fast 3-D games rendering on the Segas, 3DO, Saturns and Sony machines has conditioned kids to expect to walk virtually into the on-line bank or travel bureau and interact on screen with an attractive 3-D modeled representation of a sales person. Point and click on an icon will be *passé*. Their demonstration showed interactive on-line chat where you walk around a room and see 3-D representations of other people (you can choose your own – from blue cartoon bears to Amazon women). Walk up to them, read the name that is on a small floating panel above their heads and you can type/talk directly to them. They can also tell you to piss off and that they don't talk to blue bears.

If someone's 3-D rendered representation doesn't match the inner version of the real you, you might be the contemplative type who'd appreciate the Mindlab. Like a number of similar devices, the Mindlab wrap-around goggles with built-in LED lights (and separate headphones), attempts to stimulate closed-eye imagery, constructive brain-wave patterns, and is claimed to be particularly useful for stress management. The manufacturer maintains that in the relaxed state there is a potential for accelerated learning and increased creativity. To this end, the Mindlab comes with a number of motivational tapes and they all load different sequences of light patterns. You can run a light show in sync with your favorite music, but the optional 'PolySync' sound/light tapes are recommended for the most interesting light show. Priced at around $US350 it is not an impulse purchase, but friends who are using the Mindlab unit regularly say that the experience is similar to meditating. Apparently it gets particularly interesting when you manage to stop thinking. The brain then starts to create extremely vivid, unprompted images, triggered by the pulsing lights.

My father would understand that.

NEW TECHNOLOGY-DRIVEN CULTURE MAGAZINES ARE THRIVING. FAR FROM REVEALING A VIRTUAL REALITY, THEY REFLECT THE ACTUAL REALITY OF A CULTURE STRETCHED BETWEEN THE FAR RIGHT AND THE RADICAL LEFT.

unplugged

BY R.U.SIRIUS

Someone in the *Wired* magazine conference on America On-Line commented on the distinction between America's cyberzines, *Wired* (circ. 250,000), *Mondo 2000* (circ. 100,000) and *bOING bOING* (circ. 15,000): "*Wired* is the asshole yuppie boomer dad who thinks he's hip, driving the car. *Mondo* is the bratty alienated adolescent son in the front seat, ripped on DMT, who wants to kill his dad. *bOING bOING* is the 10-year-old kid in the back seat with a beanie hat, playing with his *Game Boy* and giggling at both of them."

Chronologically, of course, *Mondo 2000* precedes *Wired*, as does *bOING bOING*. But aside from that, the portrayal works.

SUBjectives: The View from Inside the Mondo

I was editor-in-chief and a co-owner of *Mondo 2000* when *Wired* first appeared in 1993. At that time, *Mondo* was arguably at its peak. We were producing our quarterly on a regular basis, the circulation had reached 100,000 (where it has stayed since), we had a new book out (*Mondo 2000: A User's Guide to the New Edge*) that had gone to #1 in the *Village Voice* bestseller list (based on sales in independent, non-mainstream bookstores, but still...), and we were about to be at the center of a *Time* magazine cover article on "Cyberpunk." Perhaps more importantly, we were the only place to go for writers who wanted to cover the burgeoning hip computer culture in reasonably sophisticated terms and have their work reach a substantial audience. You will then understand why when issue #1 of *Wired* appeared, our editorial staff collectively smirked and immediately hit the boards deriding *Wired* magazine as "The Monkees." (The Monkees – of course – were an unoriginal, corporate, put-together version of the Beatles.)

We were surprised by the positive response to the early issues of *Wired*. While their design veered even further than *Mondo*'s toward the *RayGun* slice-and-splatter aesthetic, the editorial voice was staid and serious, their intentions overtly journalistic. We imagined that we were appreciated for being quite the opposite. Operating without competition, *Mondo 2000* had been able to define a style for the emerging "cyber" culture that was quirky, irreverent, intentionally ridiculous, surreal, anarchic, ironic, arch but not minimalist, generous, goofy and science factional rather than traditionally journalistic (operating somewhere at the intersection of information and invention). We viewed our publication as an art form, in an almost classical sense of auteurship.

In other words, we were self-indulgent. People perceived *Wired* as being more informative, accessible, comprehensible, and better-written even. *Wired*, corporate hip incarnate, captured the populist flag. This is the way mainstreaming works, of course. It was ever thus. A dulling of the hard or weird edges pleases the masses, the corporate advertisers, *and* the politician, as one. Total win.

Conspiracy-oriented Mondoids saw a conscious plot by the New World Order, in its various manifestations, to capture the New Edge. Timothy Leary told stunned *Wired* staffers that *Wired* was a CIA plot to derail *Mondo 2000*. There was, in fact, a soft conspiracy. Initial funding for *Wired* came from the cyber-hipeoisie, people who had been given the opportunity to invest in *Mondo 2000* but couldn't relate to its sense of the ludicrous. Electronic Frontier Foundation co-founder Mitch Kapor, after his interview appeared in *M2k*, shook his confused head and told me, "All my friends love *Mondo 2000*. I don't understand why."

Aside from initial on-line flamefests (that I participated in as a *Mondo* partisan) limited primarily to the WELL (the hip California bbs), the two magazines have never spoken of each other directly, never offered a critique or a full-body-assault exposé, or mentioned each other when covered by the media.

The *Wired* strategy was to marginalize *Mondo*. On its launch, *Wired* advertised on all the public buses in San Francisco: "At last. A Magazine for the Digital Age." In a gossipy section of *Wired*'s premier issue, *Mondo* is backhandedly complimented as "fave cult rag." By late 1994, I frequently came across articles about *Wired* saying almost exactly the same things, and in the same sort of language, as had been said about *Mondo* in 1989. "There's a whole new world out there. Technology is hip. And you'd better learn the language because now there's a popular new magazine..."

Meanwhile, in the all-important subterranean level of advertising sales, *Mondo* salespeople would hear about the *Wired* pitch. When asked about how they compared to *M2k*, *Wired* reps would say how they loved *Mondo*, but *Mondo* was a *drug-culture magazine*. Ouch. Direct hit. Score 10 points *Wired*.

Mondo, on the other hand, didn't so much have a strategy as a reaction. On the internal level, the response was paranoia among the dominant conspiracy freak faction. On the level of editorial content, *Mondo 2000* shifted left. This too, was more reaction than intention, and as such was primarily implicit. And nobody noticed. (By the most recent issue, #13, *M2k* has almost become politically correct, adopting the voice of the cybercrit academic left. For example, an introduction to an article about body transformation performance artist Orlan, speaks of "the phallic gaze" and "endocolonialism.")

REjectives: Nobody Loves You When You've Been Around Too Long

Wired came along as something new at the very moment that *Mondo 2000* was starting to experience a backlash. Previously praised explicitly and frequently for its writing style, the meme went out that *M2k* was "poorly written" and going downhill. This started around issue eight. In point of fact, any reasonable person coming upon the magazine now, without the context of context, would note that each issue gets progressively more sophisticated and – yes – even more poignant – up through and including issue 11 (with Arthur Kroker, Hans Moravec, Pirate Media, Roseanne Stone, Einsturzende Neubauten, Cintra Wilson etc.).

The Backlash. In an attention-competitive, fast-forward, nihilistic, media-driven culture, mere presence for any length of time initiates a backlash. Descriptives like cyberpunk or riot grrrl surface representing relatively new cultural gestalts and hang out for 15 minutes (almost literally) before someone declares themselves "sick of hearing that word." Since the views and aesthetic gestalts that these terms describe hang on for a longer period of time, because they're an

Aside from initial on-line flamefests, the two magazines have never spoken of each other directly, never offered a critique or a full body-assault exposé, or mentioned each other when covered by the media.

The Wired strategy was to marginalize Mondo

Illustration: Ian Haig

Nearly a year ago, I ran into Jane Metcalfe, the feminine half of *Wired's* first couple, when she suddenly started wondering aloud when *Wired* would start to experience "the backlash." The backlash has started. But this time, it's actually *about* something.

authentic response to real social factors that don't change that quickly, we wind up either not having the descriptors that allow us to connect, being forced to be very inventive with our soundbyte explications, or using the deflated terms embarrassedly and advisedly... in quotes. Nearly a year ago, I ran into Jane Metcalfe, the feminine half of *Wired*'s first couple, at a party. We were chatting about something else altogether when she suddenly started wondering aloud when *Wired* would start to experience "the backlash."

The backlash has started. But this time, it's actually *about* something. At the end of 1994, the Progress and Freedom Foundation (PFF), a Newt Gingrich political front group, released its Magna Carta for the Digital Age. Co-authored by cyber-luminaries and *Wired*-fodder like Alvin and Heide Toffler, George Gilder, and Esther Dyson, this piece of self-serving quasi-libertarian (free market) cyberbabble dropped a small surprise on that substantial sector of *Wired* readership that identifies with countercultural attitudes: *Wired* was listed as a sponsor.

Wired spokespersons claimed that they had simply sent some free magazines to a PFF-sponsored conference on request, and I certainly have no reason to doubt their word. Still, the damage was done, with *Wired* and Gingrich linked up in articles in the American left publication of record, *The Nation*, and the American liberal-centrist publication of record, *The New Republic*. It didn't help when the Electronic Frontier Foundation held meetings with the PFF, emerging with a public statement that the groups found a lot of common ground between them. Jane Metcalfe is on the Board of Directors of the EFF.

OBjections: It's A Small Rightwing World After All

The impact of the technological/digital juggernaut that *Wired*, *Mondo 2000*, and indeed this author, have attached ourselves to is manifold, but two particular results seem to outweigh the others in importance. Digital technology tends towards democratizing communications. Ever-increasing numbers of human beings can send information and content directly to each other without the intervention of capital, a publisher, or an editor – presuming access to a modem and a computer. (Desktop media technology is just icing on this cake.) From a historical perspective, while acknowledging vast numbers of information have-nots, we are still rushing headlong towards a new sort of human being – a creature with a "voice" in the world.

And digital technology, in tandem with robotics and other factors, is creating a post-industrial economy. This post-industrial economy does *not* require the participation of very many people. In plain country English, there's no reason whatsoever to pay most people money for anything. The republican/libertarian solution? Let 'em eat modems. Let 'em rot.

I have ranted and raved at many hackers and people who are part of the "A" list of cyberculture. I have asked for their help. They are passionate about liberty. They are passionate about privacy. But try to talk to them about hacking the economic marginalization of the majority that leads to intolerably Third World living conditions and they'll only look at you quizzically as if you just dipped your beef jerky into the wine. This shouldn't surprise me. The techno-elite are perhaps the only group advantaged by the new economy. They will be the new lords of the terrain in a Dickensian world of beggars and servants. Just because they think of themselves as hipsters doesn't mean we should expect them to share the wealth.

Let a Million Technozines Bloom

The Megacorps – now having fully absorbed the fact that technology is a culture – see *Wired*, and only *Wired* (a recent, cute, TV ad for IBM has a group of isolated Nuns talking computerese. "I read about it in *Wired*," whispers one.) They are even willing to pay $30,000 to sponsor a page of the *Wired* World Wide Webzine, *Hotwired*, for a month. But this groovy love affair between *Wired* and the new boomer captains of the post-industrial world, wherein Megacorp big time players like Viacom's Frank Biondi and Bell Atlantic's CEO Ray Smith are puffed as philosopher kings of the late-20th century, may not be providing the same sort of voyeuristic *frisson* for *Wired* readers that it does for the wannabe players who publish the magazine. Meanwhile, a plethora of smart, independent, technoculture magazines are appearing from all over the world. Assuredly, diversity will reign. A million technozines will bloom. The new world may not be *Mondo*, but it certainly will not be *Wired*.

"These are the owners... of the main conglomerates – and what motivates them is not merely the accumulation of profits or power, but something much broader... the ability to infuse the cultural landscape with their sense of historic destiny", Arthur Kroker wrote in *Mondo 2000* #11.

"They view themselves as having a historical mission and they work to imprint their vision of the "good" human experience on everyone else. I think of John Sculley, who views himself as a Homer of digital reality, and when he moved from Pepsi to Apple, wrote himself as sort of the Caesar of the wilderness. He wrote the Odyssey, *An American Odyssey*. The owners of the computer corporations are all glamor junkies – they're all missionaries for a new historical destiny."

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AOL

Acker-On-Line

CENSORSHIP ON THE INTERNET CAN TAKE MANY FORMS, AND WHEN A WRITER AS OUTSPOKEN AS KATHY ACKER WENT SURFING VIA "AMERICA ON-LINE," TROUBLE WAS SURE TO FOLLOW.

by Rosie Cross

TO ANYONE WHO KNOWS HER WORK, THE NOTION OF ACKER-ON-LINE IS AN AWESOME ONE

Kathy Acker's psycho-charged fiction first appeared in the '70s in underground, alternative publications. However by the mid-'80s she was hitting the mainstream and attacking everything from government to education, religion to social values. Never afraid to challenge the reader, her work was described as post-punk porn and post-punk feminism. From *Blood and Guts In High School* (1984) to *My Mother: Demonology* (1993), imagery of outlaw bikers, crazed pirates, and diseased whores established a surreal literary landscape worthy of William S.Burroughs, with more than a passing bow to the giants of perverse fiction, the Marquis de Sade and Jean Genet.

Acker has always mixed her writing with readings and performances, events renowned for their confrontational approach. However, her rapid-fire style made her a natural-born Net-surfer, and when she took to the Internet, she found an alternate venue for her anarchistic impulses, and a place that provoked her interests in unpredictable and shifting realities. She also found trouble.

Taking an account with America On-line (AOL), Acker built a reputation as an outspoken denizen of the Net. But AOL took a dim view of her anarchistic attitude and have taken their revenge

You got kicked off AOL. What did you do?

I was on-line with a friend. We were a little drunk, and I can't remember what the hell we did. She had never been on-line before, so I said, 'OK, I'll show you what it's like, although AOL is so boring.' Of course most of the chat rooms were filled and I said 'Our next best bet is the MTV chat room, not many people go there.' I think we asked if there were any dykes in the room, that's my only memory, and there was some guy who started pestering us.

Sounds like normal drunk on-line chat.

Exactly, hardly anything out of the normal.

It's hard to understand the American need for control when the right to free speech is constitutionally protected.

(laughs) Are you asking why Americans are so moralistic? I dunno. Americans have always been like that, nothing changes

I heard a rumor that you were kicked off-line for endless rants about masturbation.

I doubt it was that improper. AOL had this attitude about me: 'You are a bad girl, and we've got this permanent mark against you,' and it got me really angry. So I wrote to them stating they were a totalitarian state and I told them I wasn't paying for no totalitarian state.

Did they simply delete your account without informing you of what was going on?

No. What they did is they deleted software and didn't delete my account. So when I tried to figure out what was going on, and why I was still being billed for an account I wasn't using, they kept me on the phone for hours, talking techie talk with no results, and after working 14-hour days and then doing all this stuff, I finally said, 'Go to hell all of you, just take me off the damn service.'

Doesn't sound like a positive introduction to the Net.

Yeah, well, AOL (hmpf) – I wanna get on the Net directly. Friends like R.U. Sirius and Jude Milhon [St Jude] have been telling me how. I'm not that technical you know, AOL was the first service I ever used, so for someone like me it's going to take a few hours of maneuvering to go direct.

It's the way to go.

Otherwise you are just being policed by these creeps.

The 'thought police' on the Net.

Well they are everywhere, not just on the Net. I get really angry. I am still very angry at AOL – they invaded my house as far as I am concerned, they went into my home/computer and took the damn software off – it was like being raped or something.

The Net is far from utopian.

At the moment it sure is

Do you think you will create spaces for yourself on the Net, where you feel comfortable? Maybe you'd like hanging out in women-only spaces for example.

I've always done my own thing haven't I? I'm no separatist, I guess I hang with freaks...

A lot of people suggest this form of technology is inherently democratic.

Oh come on – the world we live in? A lot of people are talking about how much they can police the Net. In comparison to that future it's relative. I don't think it's utopia (now), but it's better than potential censorship and policing. Imagine a scenario of all services becoming like AOL. My friend Richard Kadrey says no matter what they do, there will always be cracks, and all of us will hang out in the cracks. We do that now, don't we?

It's more fun that way.

It's like life. The ones with the money will have huge houses on the Queen Streets and the rest of us will slurk and murk around. Nothing is different on the Net.

Do you think about strategies when you're on-line? Your friend St Jude likes to fight with words...

I just do my books. I do what I do. I don't think about strategies. If a service like AOL kicks me off I just think fuck 'em. If we are talking about strategies – and I haven't even thought of Net strategies yet – I think it's best to be as open as possible and just

she found trouble

When she took to the Internet, she found an alternate venue for her anarchistic impulses, and a place that provoked her interests in unpredictable and shifting realities.

I don't think we know what the possibilities of the Net are yet

do what you do and let people make of it what they want.

What's the new book you are working on?

It's called Pussy, King of the Pirates.

Maybe it's not intentional, but it's a good analogy to the Net being somewhere where everyone surfs – the boring old white, male, Californian surfer looking for the big wave to come in. The concept of pirates makes me think of swashbuckling adventures and not staying too long at any port, it's an open sea rather than a surf beach. The imagery seems to crop up a lot in your work. Is being a pirate a childhood fantasy of yours?

I'm not sure where it comes from. I just like pirates.

The first introduction I had to you was Blood and Guts in High School. *I wasn't so aware of it then, but your style is very hypertext. The way subjects, images, imaginings are linked – or should I say hyperlinked?*

Most people know of me because of *Blood and Guts*. I agree with you about my work being like hypertext – it's extremely hypertexted. I know a lot of the people designing Web sites and some hypertext authors are making room for me on the World Wide Web because they know how well my work would fit into that environment.

Do you refer to your work as hypertext now that there's a name for it?

I do and I don't. In a way I write like that, I take stuff and I put it here and there, I write the way WWW people do, but I use notebooks. I still and have always used cut-and-paste, but I think my stuff is a little funkier than a lot of hypertext material available at the moment on the Web. I am not sure about that, but I will know for sure when I go direct!

It's most peculiar...

It's a big living mind.

Does the Net offer further expansion for your work?

Sure. I have been talking with friends and it would work real well with this little book I have based on the new novel. What we have done is taken a chapter and used some graphics and pictures, and I'd really like to see it on the Net. Eventually you can do real-time visuals and music on the Net that I couldn't do alone. I think you can go way farther mixing media. It's perfect for the stuff I do. The hypertext stuff I have seen doesn't mix sound and graphics. I am sure there are sites that do, but I haven't had an opportunity to see them yet.

Generally Web sites are collective ventures. Do you like working in a collective situation?

I don't like working with other writers much. It's my own private little space, but I like working with other artists a great deal.

You don't hold back in your work, do you like that feeling of being constantly exposed?

Pretty much. Writing is really lonely. On the one hand, it's so lonely to just sit in this room and scribble notes all day, and then there's this extreme exposure once the work is out there, so I enjoy both.

You haven't experienced a lot of the Net yet, have you?

I am a complete virgin when it comes to this stuff, I admit it. St Jude took me out shopping one day and said, 'Kathy, what you need is a modem.'

Jude is a techno junkie.

You're not kidding, but then I have been addicted to the damn thing since I got on too. For about a month now that's all I have done – stuck in front of this machine. I'm obsessed, I work on my books, I do my readings, I go for bike rides, but the minute I am back inside that door, what do I do but turn on that fucking computer.

Do you like technology?

I never thought about it before, the only thing which counts as technology before this is my motorcycle.

In your writing you have played around with role switching?

Twitching?

Switching

Twitching. I like twitching better.

Okay then, in your writing you've played around with role twitching. Have you used the Net to experiment with twitching gender roles and personality? Have you had much response from others on-line? As far as you know they may very well be doing the same thing.

I'm real curious about sex on the Net. I always think of role playing as being something you're not. I don't role play like that, probably because I don't have a strong sense of who I am. So I don't role play, I'm just plain ol' schizophrenic me, or something. It's not like my on-line or real-life personality comes out from a centered identity.

I wouldn't think you'd adopt another identity or enjoy playing the pseudonym game on-line. Why would you want to be someone else?

It made me feel really uncomfortable. AOL asked, 'What other names are you going to use on-line?' and I said , 'Huh. What do you want? My stuffed animals' names?' So I chose some of them, and AOL seemed happy, not that I saw much point in it. With my new account on e-world I am just Acker, so I guess if people wanted to find me they could, it doesn't bother me. People have bugged me in real life but it's not a problem on-line, not yet anyway.

What do you see as possibilities for anarchy and radicalism on the Net?

Amazing things are going to happen. I can't tell you some of them. We have this huge, overall monolithic government, and the one way we get away with being free and try as best to avoid the McDonald's culture, is that anarchists go unnoticed. It's the only freedom that's here. There's no freedom among the liberals or the conservatives, and I am sure the parallel exists on the Net in the same way as in real life. A huge organization like AOL with 200,000 members simply cannot be controlled, even if they do throw a few people off.

What will anarchy on the Net be like, will you transpose a lot of past radical ideas and tactics?

I am sure that both old and new ways will be effective. Once you use a new medium you do it different ways, in fact every time I write a book I do it a different way. I am learning a lot about doing things differently. This great woman, Freddie Baer, designed this little book that's coming out, and she'd like to design a Web site which is touch sensitive – silk screens which you can touch and they will lead to new words and links.

A lot of your work is thought of in terms of writing, theater, dance, opera. Can you incorporate all these different styles into, or onto, the Net?

I don't think we know what the possibilities of the Net are yet. I think what's happening is that we really should start concentrating on developing a new language for this thing. It's most peculiar. It's a big living mind.

A *meme*!

It is. No one has even started to explore all the psychic stuff that goes around it. I work a lot with dreams now, and when I started to spend all my spare time with the computer my dreams stopped. I thought 'hmm, what's the connection with that and having this living mind in my house?' Very weird

A lot of groups who are interested in those sorts of subjects are at present marginalized, but with continued Net expansion we'll start to see and hear more about topics such as dreams, magic, and so on.

I think that's true, but I don't know what will happen.

Do you think that the Net will become another medium where you will be accused of trying to shock people?

I was never, ever interested in shocking people. People got shocked, but that was their business. People have always had a weird relationship dealing with women's bodies. Men and women, I'd say men more so, they are so bloody uptight, they just don't hear anything sometimes.

Given your appropriation of text by other writers, how do you feel about the potential of your work on the Net being manipulated and appropriated by others?

It is already. People tell me that so-and-so is putting my work on the Net without permission, but that's cool, it's a compliment they are reading it.

Do you appropriate other people's work?

If it's out in the world you use it. Life doesn't have copyright written all over it.

Who do you read? I know you like the work of Noam Chomsky a great deal.

Oh yeah, sure do. I read a lot of women theorists, I read a few male theorists: Stephen Foe, the Krokers [Arthur and Marilouise], novelists...

In the Acker books I have been exposed to, you don't theorize a great deal.

I wear a lot of hats, and part of the work I do is sometimes theory. I sometimes make a living out of being a professor. I talk about it in my work more and more, like tonight we were using this book *Three Steps on a Ladder of Writing*. I don't think theory disqualifies the dream experience.

What do you think about cyberhype? What reality is being bent, manipulated, or extended when you're inside the machine?

I have never believed reality was that rational or that predictable. I don't think reality is set – reality is living, it's constantly changing. I think the Net is cool, it's almost exactly the same feeling as when you are working psychically, or when you're meditating. What we do on the Net, others can do without all that equipment. It's like flying.

I've heard that people generally have more psychic or spiritual experiences as they get older. Perhaps the Net works as a catalyst for such things to occur. I've also heard that it's a human trait to resolve psychic and spiritual matters with visceral things before one dies.

I think there is something to that, you're not as driven by things like LUST. When I was 23 I couldn't see or think of anything else (laughs)...

Do you view the Net as pornographic?

I think that about everything. I am constantly thinking about sex. I think sex when I am on the Net. My machine is a big ol' toy and I don't know all the aspects to it or about it yet but, sure, sex is one of them, and like everything else I will explore that part of it too. Sex to me is like hunger, and I am damn hungry most of the time.

Is there a relationship between sexuality and the machine?

No, it's not a machine to me. It's more like a living mind. I am not interested in the machine parts. I think the same way about the motorcycle, I think of it as being alive, I have two bikes, a Virago 1100 and a 750.

I know you very much like the work of multimedia artists VNS Matrix. They have been known to say that "the clitoris is a direct line to the matrix." Following on from what you have just said, I doubt if you'd agree with that statement.

VNS are so cool. I connected with them a while ago. I am so impressed by their work, but I wouldn't agree with that statement, no. I never thought of the connection between the machine and me as being clitoral. Right now it doesn't feel clitoral. The clitoris, to me, is this kind of direct little burning sensation between my legs. This is just me, but it's deeper, and more general than direct. Everyone's body is different. The Net can be like an orgasm, but at the moment I'd still say it was like flying and having lots of fun. But I distrust it too. Sometimes I feel like it's a mind eating me. I have lots of theories about the ravenous nature of my machine, especially when I got it and it kept wanting more and more RAM and other bits and pieces. I have to be careful it doesn't devour me. I imagine the computer getting fatter and fatter and not allowing me to dream ever again and sucking out my thoughts.

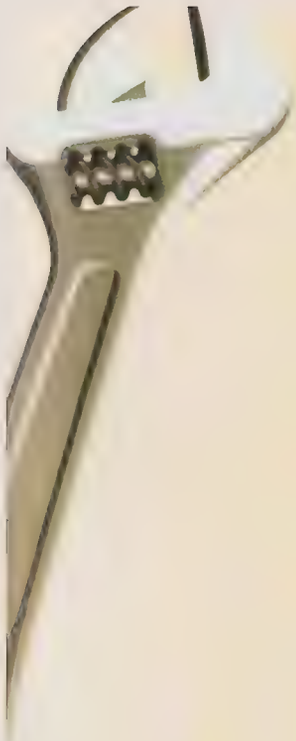
Could your machine replace a lover?

No way! Flesh and blood is the best. Net sex might be okay, but I doubt it could replace my motorcycle. ★

The Net can be like an orgasm, but at the moment I'd say it was like flying and having lots of fun...

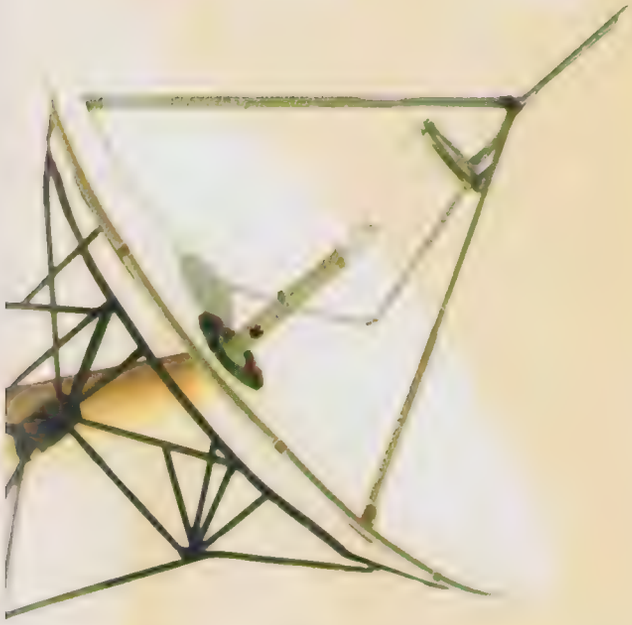
Sometimes I feel like it's a mind eating me... I have to be careful it doesn't devour me. I imagine the computer getting fatter and fatter and not allowing me to dream ever again and sucking out my thoughts.

"there is an intimate and possibly subversive



element between women and machines"

especially the new intelligent machines, which are no longer simply working for 'man,' as are women no longer simply working for man."



A NEW ALLIANCE IS APPEARING BETWEEN WOMEN, MACHINERY AND NEW TECHNOLOGY. SADIE PLANT CONSIDERS A REVOLUTION IN WHICH WOMEN ARE NO LONGER DEFINED BY MALE TERMINOLOGY: THE SUFFRAGETTES OF THE NEW MILLENNIUM.

by Rosie Cross

Illustration by Elena Popa

DR SADIE PLANT'S OBSESSIONS READ LIKE A GUIDE-BOOK FOR ANARCHISTS. HER CONCERNS HAVE led from the radicalism of Guy Debord and the Situationists, who lent a hand in the Paris Riots of May '68, through to a huge variety of anti-authoritarian thinkers and practitioners.

Her most recent forays, however, have less to do with the history of anarchy, and more to do with the future potential of 'Cyberfeminism.' While teaching cultural studies at Birmingham University, England, Plant became fascinated by cybernetics, drugs, the issues surrounding machine intelligence and self-organizing systems, and what she has encapsulated as cyberfeminism. All of which, says Plant, are "becoming increasingly important for women today."

Plant has investigated these issues with a vengeance, writing what have become seminal texts in an essentially new realm. Her books include *Cybernetic Hookers: Women, Drugs and Intelligent Machines*; *Beyond the Screens: Film, Cyberpunk and Cyberfeminism*; and *The Future Looms: Weaving Women and Cybernetics*. They traverse an extraordinary range of knowledge, from the history of drug use (with specific reference to women using drugs for their creative endeavors), the representation of women in recent cinema, and the potential of communications systems to create a less sexist future.

"Cyberfeminism suggests that there is an intimate and possibly subversive element between women and machines," says Plant. "Especially the new intelligent machines, which are no longer simply working for 'man,' as are women no longer simply working for man."

women have always been the machine parts for male culture

women have been the means of reproducing the species, which is obviously similar to the role of machines and all tools.

ROSIE CROSS: WHY DO YOU USE THE TERM CYBERFEMINISM?

Sadie Plant: I started using "cyberfeminism" quite independently of any other use I'd come across. I'd never seen the word used before. This is one of the reasons I was delighted when I came across the work of VNS Matrix [multimedia artists who are involved with cyberfeminist aesthetics]. Cyberfeminism, to me, implies that an alliance is developing between women, machinery, and the new technology. A lot of women really love this type of technology and because of the "toys for boys" complex it was curious that they did. I thought women should be encouraged to go with their desire.

Initially, I used the word cyberfeminism to indicate an alliance, a connection. Then I started research on the history of feminism and the history of technology. It occurred to me that a long-standing relationship was evident between information technology and women's liberation. You can almost map them onto each other in the whole history of modernity. Just as machines get more intelligent, so women get more liberated.

DOES CYBERFEMINISM IMPLY THAT PATRIARCHY IS DOOMED?

Obviously a number of tendencies have developed. Tendencies of feminization exist economically, particularly in industry and employment practices. It's not happening because people are trying to make it happen, or even because feminist politics are driving these changes, although that is a part of it, but changes are occurring almost as an automatic process. This process is underway, and women do become more important, especially in advanced capitalist cultures. And it seems there is a shift right across the world. In every sense, geographical shifts are occurring from the center to the periphery. Sexual relationships are also shifting as well, it's beautifully effortless, it's an automatic process.

DO YOU THINK A PARADIGM SHIFT IS OCCURRING? SAY, AN EXCHANGE FROM A DECIDEDLY MALE PARADIGM TO A FEMALE PARADIGM IN TERMS OF WHO HAS POWER IN THE INFO-TECH WORLD?

The two start to converge. In a sense women have always been the machine parts for a male culture. Women have been the means of reproducing the species, reproducing communications as secretaries etcetera. Which is obviously similar to the role of machines and all tools. So, I think there really is a concurrent process, as machines get more autonomous, so do the women. I think women, once they start to make the connection, feel more comfortable with the technology. And the notion that it is all masculine is a convenient myth sustained by the present power structures. This myth is increasingly irrelevant, and is an untrue picture of what's occurring. A lot of the new thinking is being provoked by the whole cyberpunk movement, by which I mean not just the literature, but the whole chaos-techno-culture in which men participate in an increasingly 'feminized' way.

BUT AT THE MOMENT, GENERALLY SPEAKING, FEW WOMEN HAVE ACCESS TO THIS POWER OR ARE CAPITALIZING ON THESE SHIFTS. WHAT ABOUT THE GAP BETWEEN INFORMATION-RICH AND INFORMATION-POOR WOMEN?

It's important to realize there is never an instantaneous change. But, nevertheless, if you look at the historical situation, and women's liberation so far, you can begin to track future potential. Access to technology is widening. Even though we still have problems, it seems implicit in economic and political terms that these processes are automatic.The power structures with a vested interest – be they men or women in those power roles – won't hang on to them forever. The material processes underway totally mitigate against that. There is always a split between intentions and effects. The intentions of the military, or similar power structures, may *intend* the technology to be for them, but the effect is quite different. The more they [the military] want it for themselves, the more, paradoxically, they end up spreading it around. We are in the first wave of information technology, and, of course, issues of access are important, but soon the issue will not be access, but how to avoid it. Soon it will be like Coca Cola.

DO YOU THINK ACADEMICS HAVE AN ENTRENCHED INTEREST IN THE NET?

The basic position we are in is that new technology is running away with itself. This is a good thing; to assist in the destruction of existing power structures. Ironically, the more you try to protect what you have, the more it works against you. Take hacking; the more security on the systems, the easier it is for the hacker to get in. In Britain at the moment there is a huge proliferation of e-mail and BBS (bulletin board systems). Even if the Internet remains a largely academic system, which I doubt, it won't matter for long, due to the other systems and social forces in play.

WHAT ARE THE MAJOR FORCES FORGING A PARADIGM SHIFT?

Definitely economic. The software producers want to sell this stuff. If it's not free, it's getting very cheap. Prices are plummeting, we are witness to accessible technology via the market forces inherent within capitalism.

BACK TO YOUR POINT ABOUT THE CONSTRUCTION OF CERTAIN MYTHS, YOU DON'T AGREE THAT GIRLS ARE TECHNOPHOBIC?

Generally, girls are brought up to avoid interaction with technology. Nevertheless, women's relationships with machines are more historically intimate than men's. Now, for instance, girls grow up with technology, it isn't new to them. The question of technophobia, is that it is increasingly a myth. I think it's a shame that a lot of feminist theory buys into this notion of technophobia; it not only buys into it, it's keen to perpetuate it.

YOU SEEM TO IMPLY A CERTAIN AMOUNT OF ANGER AT THE COLLECTIVE. BUT HISTORICALLY AND ALSO IN ANTI-AUTHORITARIAN MOVEMENTS THE

COLLECTIVE HAS BEEN ESSENTIAL IN ORDER TO ASSIST CHANGE. WHAT DO YOU NOW THINK ABOUT THE ROLE OF THE COLLECTIVE VERSUS THE ROLE OF THE INDIVIDUAL?

For a long time I have questioned the authoritarian nature of the collective. By the same token, as you suggest, you can very often feel alone on the Net, there are possibilities which exist which are not one nor the other. Again, these exist due to the emergence of new technologies and new forms of communications. The notion of networks=feminism=technology, opens up new possibilities which can create far looser, but not less important, connections for women. It's far easier to pull out or work with the group when it's necessary or desired. You can use the technology for single purposes rather than having to heavily invest an interest for the collective. The younger generation seems to be far more effective in just doing this, and not being aware they are creating new political spaces.

BUT CAN YOU ESCAPE THE ISSUE OF GENDER ON THE NET?

I think it's increasingly advantageous to be female. So many men take on female personae, that the gender issue has become an increasingly murky thing to discuss. There is everything to play for. It's fascinating that men want to play at being women. It's an opportunity they have not had presented to them in the past. It also implies a recognition by men that to be a woman in the past was a liability, but now it's a distinct advantage and privilege in the future. The male is basically becoming redundant. Traditionally it's been about the male in the abstract – the white man. With the emergence of new technology, a general process which was once the means to serving the ends of patriarchy, is now providing their own autonomy. Capitalism, commodities, new machinery and women, all the things that served man's ends, are starting to pick up and go their own way. This is on a global scale. You can witness the shift from the Atlantic to the Pacific culture. In certain stages capitalism has no loyalty, and men are finding out women have no loyalty to men.

DO YOU THINK TECHNOLOGY IS SEXY?

Yeah, really sexy.

BUT AREN'T WE POSITIONING WOMEN INTO STEREOTYPICAL RELATIONSHIPS WITH THE TECHNOLOGY? WHAT IMAGE IS BEING CREATED?

This is the great split between intentions and effects. Cyberpunk fiction has created these *femme fatale* roles. It's been a very unpredictable process. Male writers have created very sexy roles for women, they have no apparent feminist agenda in doing so. Strong female characters – in films, books, etcetera – can only be beneficial to the goals of feminism. These writers have effectively assisted the feminist movement.

LET'S TALK ABOUT THE FUTURE.

We will see enormous changes in the whole notion of what it is to be human. Women are just starting to realize that they have been defined by a male definition. Now all intelligent commodities are challenging these definitions. The notion of agency gets challenged. As men slide out of this definition of identity, as they become more feminine, I doubt women will stay where they are, they will move as well.

DO WOMEN GET MORE MASCULINE?

Absolutely not! Men are effectively catching up. Women, too, will become more feminine, even though we have no idea what that is. We are going to experiment with it, we are going to find out.

WHAT ROLES WILL BE CREATED BY MEN TRYING OUT FEMALE PERSONAE? IS THERE A DANGER OF PERPETUATING CERTAIN OPPRESSIVE ROLES?

There is an absolute danger of that. Men can step into those roles, but many women will step into totally unprecedented roles. When you have been always crammed into a man's idea of female, I think for women the possibilities are endless. For men, well...

IN **CYBERNETIC HOOKERS** YOU DISCUSS DRUGS AND TECHNOLOGY. IS IT HARD TO DISCUSS DRUGS WITHOUT FEELING A DEGREE OF RESPONSIBILITY?

Drugs are very complicated. They represent another analysis of the divergence between intention and effect. But, historically, drugs have been used for the benefit of men. Ada Lovelace [regarded as the world's first computer programmer, who collaborated with Charles Babbage to invent the "mechanical computer", or Analytical Engine, in the 19th century] who clearly had great difficulties, was successful in adopting a masculine code 100 years before it was done. She used opium for pleasure and achieved some of her best mathematics under the influence of drugs. In history the representation of drugs as feminine has also been very evident, such as "mother coca," "maryjane," and so on. There is a definite parallel and cultural collision between the emergence of new technology and the design of machinery. This is very much about, and connected to, the drug experience. It's interesting that a lot of Californian design is about reverse engineering the drug experience. It's probably an unconscious effort.

ARE WE ALL GOING TO BE CONSUMERS OF WHITE MALE CALIFORNIAN CULTURE?

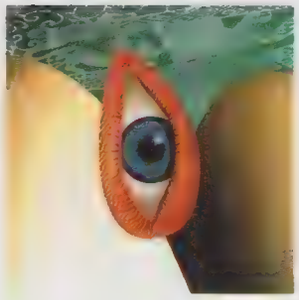
No! I see a shift from European culture to the Pacific. There are some really interesting developments in Southeast Asia and China. The biggest economies are being developed in that region. A very different scenario than what we have now.

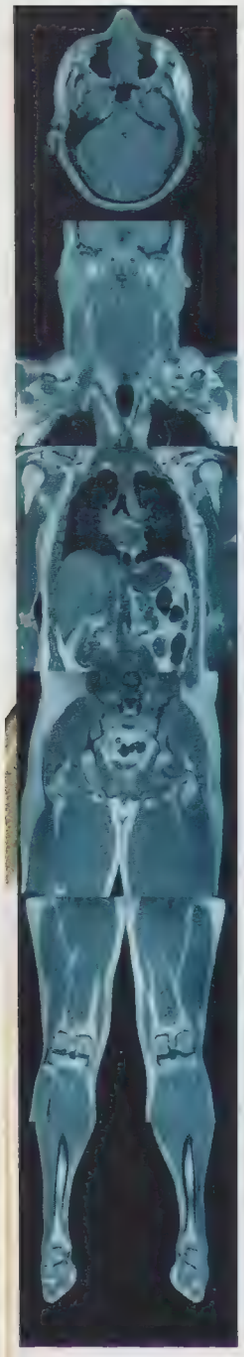
ARE YOU CONCERNED THAT UNDERPAID SOUTHEAST ASIAN WOMEN WILL TOIL AWAY PRODUCING COMPUTER COMPONENTS FOR THE WEST?

It's only that process of feminism which has proved in the West to liberate women. Certainly it has helped in Japan. There is great unprecedented activity of women in Japan experimenting and finding themselves. Most of the workers finding themselves being made redundant are the traditional male workers. It's not going to hurt to have a slight turning of the tables. The absolutely new activities women will indulge in in the future, we can't even guess at.

DO YOU AGREE WITH THE AUTHOR OF **SIMIANS, CYBORGS, AND WOMEN,** DONNA HARAWAY, THAT TECHNOLOGY IS A DEADLY GAME?

Only for the white guys. ■



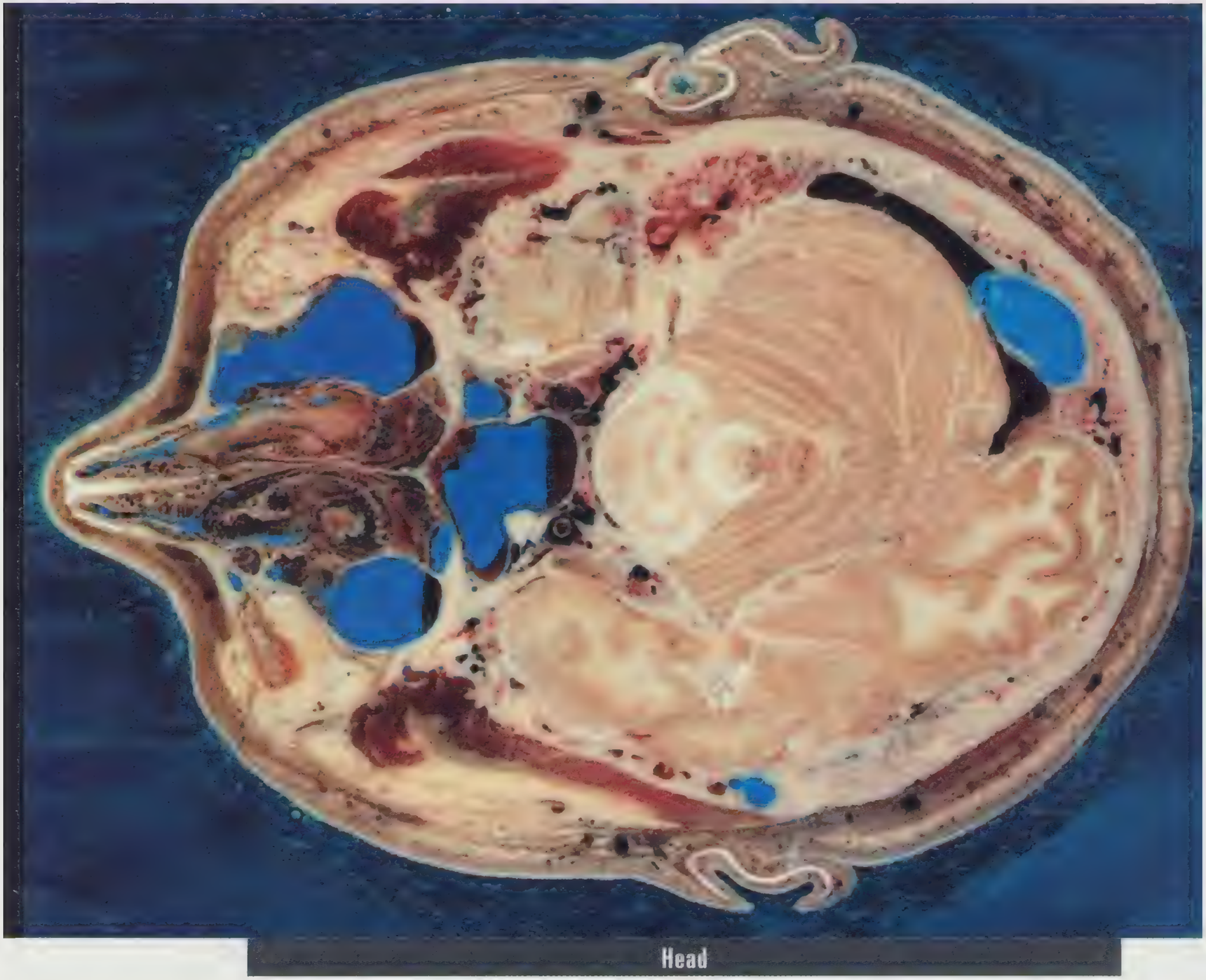


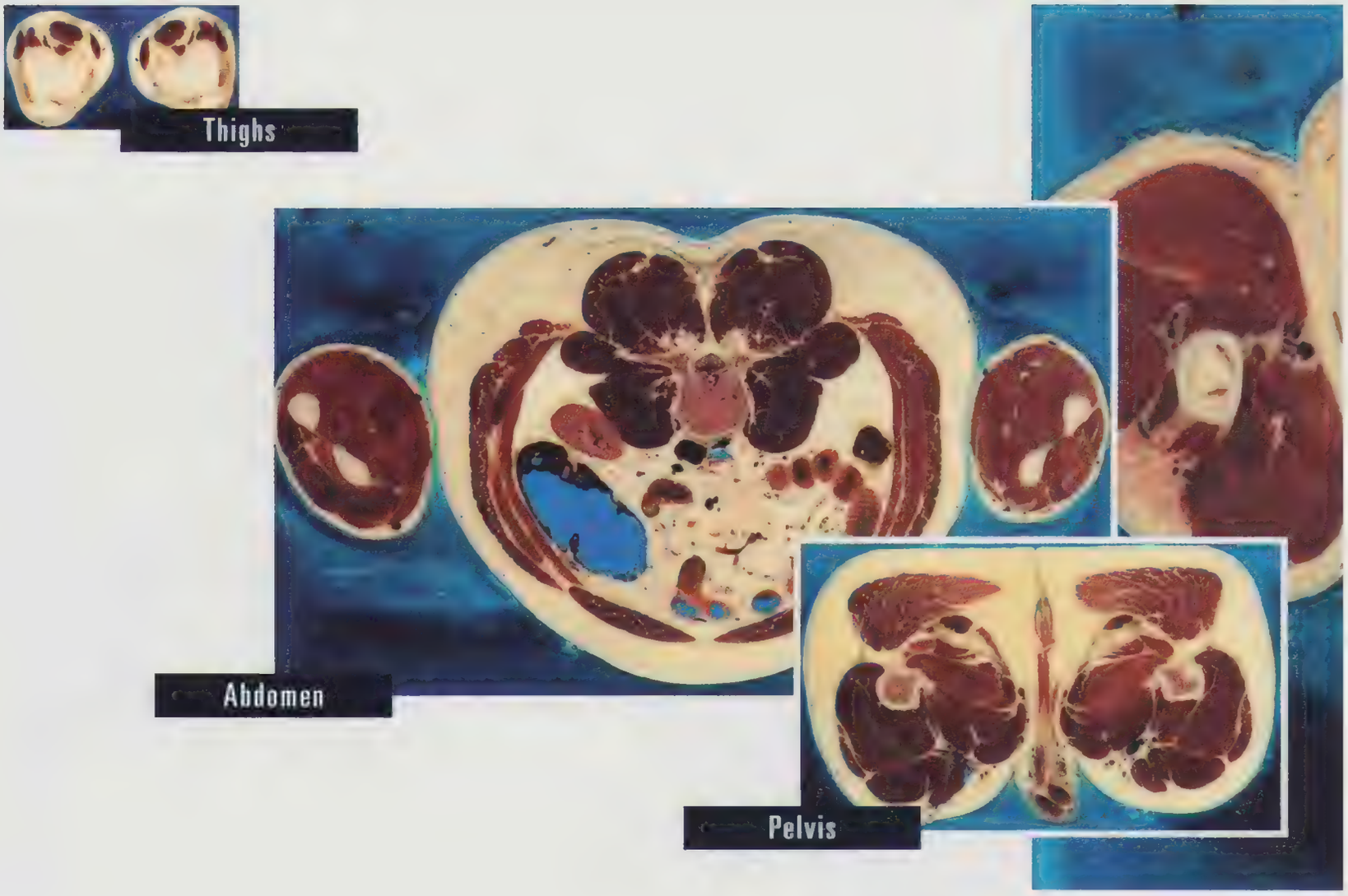
anatomy of a murderer

WITH A LASER-GUIDED PLANING DEVICE THAT LOOKS LIKE A DEMONIC MEAT-SLICER, JOSEPH PAUL JERNIGAN WAS SLICED INTO 1,871 PIECES AT ONE MILLIMETER INCREMENTS. EACH SLICE IS NOW ON THE INTERNET, AND THE ONGOING RESEARCH WILL PLAY A CRUCIAL ROLE IN THE DEVELOPMENT OF TELESURGERY.

by David Ellison

APPLE'S ADAM: Convicted murderer Joseph Paul Jernigan (center), executed in Texas in 1993, has become the first computerized man, known as Adam. The anatomical sections (far left) were downloaded on 21•C's Apple Macintosh from the Visual Human Project's Web site at the National Library of Medicine in Maryland. Jernigan's body was sliced at right angles to the upright body.





FANTASTIC VOYAGE: The 3-D data sets allow Jernigan to be taken apart and put back together. Organs can be isolated, dissected, orbited; sheets of muscle and layers of fat and skin can lift away; and bone structures can offer landmarks for a new kind of leisurely touring. The images from left to right are: thighs, abdomen (with arms to the sides), pelvis and thorax (again, with arms to the sides).

IN NOVEMBER 1994, 39-YEAR-OLD JOSEPH PAUL JERNIGAN went global. He was the highly visible human of the Visible Human Project, a new destination on the Net that had just opened its doors for business. On offer was a 3-D atlas created from a male cadaver, a vast database that allows users to tour the body with the speed and efficiency of a theme-park ride – a ride of someone else's life

Jernigan's one-way trip to cyberspace began in Dawson, Texas in 1981, sometime between the moment he was surprised by the owner of the house he was burgling, and his decision to murder the man, with three blasts from a shotgun. Jernigan was found guilty of the killing and sentenced to die by lethal injection. Numerous requests to the parole board to reconsider the case failed, as did a last minute bid to the Texas Court of Criminal Appeals. On 5 August, 1993 an "ultra fast-acting barbiturate,' probably sodium thiopental, was administered by prison officials through an intravenous catheter attached to Jernigan's left hand. The drug, which acts as a respiratory depressant, zeroed in on the part of the brain that controls the unconscious breathing rhythm. In effect, Jernigan's body forgot how to breathe

His head and shoulders jerked, he coughed six times, and at 12:31 a.m. he was pronounced dead

Typically bodies are released to relatives, or buried by the state, but Jernigan had signed a donor card authorizing the use of his organs for transplant purposes In such cases officials consult a wish-list circulated, by hospitals and research groups, among institutions that deal with – or, as in this case, produce – the newly dead. As Jernigan's organs were poisoned by the administered barbiturates, they could not be transplanted, so other uses were considered. One of the groups scouting for a body was the Visible Human Project. They weren't worried about toxicity, they just wanted someone who looked about right for his age and weight. They wanted an average Joe

Thorax

The Visible Human Project is based at the National Library of Medicine (NLM) in Bethesda, Maryland. In their long-range plan of 1986, it was recommended that the NLM investigate the feasibility of establishing a biomedical image library. In 1987, Dr Michael Ackerman, who later became project officer of the VHP, visited the University of Washington's medical school, where he saw a head on a computer monitor. By manipulating the mouse, the skull opened to reveal parts of the brain.

Ackerman felt this was an excellent tool for teaching anatomy, if only some way could be found to get the whole body on to a computer. This became the focus of the NLM's move towards an electronic image database. In 1991 a contract worth $US 1.4 million was awarded to researchers at the University of Colorado in Denver who were given the task of selecting, preparing, and imaging the cadaver for the database.

While his body was still warm, Jernigan was flown from the prison in Huntsville, Texas to the lab in Denver where he was run through a Magnetic Resonance Imager (MRI) and a Computerized Tomography Scanner (CAT scan), which provided three-dimensional images of both bone and soft tissue structures. At this point Jernigan's body was placed in a foam mould and packed in dry ice. The cadaver was embedded in vivid blue gelatin, frozen at minus 70° C, and then cut into four blocks, with cuts made at the nipple line, the upper thighs, and just below the knees. The sectioned body was then returned to the cooler for several months, during which time meetings took place at which radiographers and anatomists considered the candidates for the 'atlas." They had to be free of infectious disease, cancer, tissue deterioration, bone deformation, trauma, burns, artificial hips, or any other prosthetics. At a pinch they would allow dental fillings. These criteria eliminated most of the 6,000 bodies donated to the Texas and Maryland anatomical boards. Jernigan's body was one of 30 cadavers to be closely reviewed by a committee of specialists who were to make the final decision.

Feet

According to Ackerman, this review committee knew nothing of the way that Jernigan had died, beyond an anonymous death certificate indicating barbiturate overdose. Consulting the MRI and CAT-scan images, the committee determined that, based on his anatomy, height, weight, and proportions, Jernigan, 177 cm and 95 kg, was perfectly normal and therefore ideal for the atlas.

His body parts were retrieved from the freezer and, starting with the lower legs, each section was fitted into the Cryomacrotome, a laser-guided planing device that looks like a demonic meat-slicer. Working at right angles to the upright body, Jernigan was sliced into 1,871 pieces at one-millimeter increments. After each slice the newly exposed layer was photographed by 35 mm and 70 mm cameras. These images have a kind of casual horror about them; a lozenge-shaped torso in cross-section revealing the strange balance of symmetry and chaos within, and, nestled to the right and left, what appear to be two small hams, actually his arms hanging down by his sides. Each one of these images was later scanned into a powerful animation computer that, through a process known as volume rendering, stacked the slices to re-assemble the body in three dimensions. The resulting data set allows Jernigan to be taken apart and put back together. Organs can be isolated, dissected, orbited; sheets of muscle and layers of fat and skin can lift away; and bone structures can offer landmarks for a new kind of leisurely touring.

Later this year Jernigan will be joined on the Net by a female counterpart, an as-yet-unidentified 59-year-old woman, described as "heavy-set," who died last year of a cardiovascular illness. "Eve," as some commentators have tagged her, was quite difficult to find, as potential male candidates outnumbered females 10 to 1. She will have the same characteristics as Jernigan, with an important exception. Improvements made to the Cryomacrotome have allowed technicians to obtain images at 0.33 mm intervals. As a result, it was possible to section her into over 5,000 pieces which will be available to anyone with access to the Internet and a BIG computer. It requires two weeks uninterrupted download time and around 50 gigabytes of storage capacity, which more or less eliminates your average Net-user. But, with access to the World Wide Web, it's possible to drop in on the NLM home page that offers six full-color anatomical cross-section images of Jernigan's body, as well as some preliminary CAT and MRI scans. Each of these snaps are over six megabytes in size so you might have to make room if you want to look. Assuming you had access to some heavy duty hardware and you wanted the whole body, you would sign a comprehensive licensing agreement with the NLM declaring what you want to do with the atlas and promising to show them any products developed through its use. The NLM does not want to share in any profits, but they do want to know how the atlas is being used and how it might be improved. When the Project was released in November, 300 companies expressed an interest, including a software firm developing a game based on the SF film *Fantastic Voyage* in which miniaturized American scientists on a life-saving mission are injected into the blood-stream of a man shot and critically wounded by Soviet Bloc operatives. In the near future you too could be speeding down arteries, meeting monogranular leukocytes with attitude, and doing battle with the big, bad blockage in the brain. In the game, Jernigan's body will be the setting for a dramatic life and death struggle which in reality is a foregone conclusion.

These developments are a little further down the track. In its current form the VHP doesn't do much beyond letting you look. This will change. The next phase will team new software with supercomputers to get Jernigan back up and running – jumping, bleeding, and generally simulating Work is being done now on re-introducing tissue elasticity to the body and on a "point and click" routine that will allow medical students to replace Jernigan's healthy kidney with a diseased counterpart. In Ackerman's words, "Ultimately what we want to do is picture the lung and watch a tumor grow. That would be the ultimate goal."

Some anticipated uses for the atlas in its current and future forms include casualty physicians plotting the path of a bullet before operating on a gunshot victim; sports franchises monitoring the treatment and course of player injuries; the clothing industry testing the shape and durability of garments; simulation of complex surgery with random complications; and the testing of replacement joints on virtually contracting muscle tissue. The U.S. military has also expressed an interest in the atlas for use in the development of a computer-generated human body that will allow doctors, nurses, and medics to practice combat casualty wound care. The unlucky body in question can be repeatedly wounded, repaired, and sent back for more. This same body will play a central role in establishing protocols for telesurgery, where surgeons will operate on patients, from a distance of hundreds of kilometers, using VR technology.

The Visible Human Project is understood as a "greater good" kind of undertaking that will better our lives through enhancing the skills of the surgeons who operate on us, the coaches who train us, the armies who defend us, and the industries that amuse us. The kind of hype surrounding the project is best summarized by the atlas' role in a forthcoming exhibit of da Vinci's anatomical drawings to be held in Tokyo. Here the VHP will function as hard scientific proof of the Master's genius, gentle corrective to Leonardo's occasional goofs, and finally as something like his rightful heir. The atlas has much to offer, and is in many respects an ingenious undertaking, but it also reveals much about contemporary bio-ethics and the way we are thinking about bodies at the end of the 20th century.

Jernigan donated his body to medicine and, although it's worth asking to what extent one can donate from death row, it seems likely that at least the rudimentary requirements of

The virtue of Jernigan's cadaver lay in its perverse state of fitness. The industrial and scientific value of the VHP is tied inextricably to a system that produces an unmarked corpse in excellent health.

informed consent were satisfied. This, according to medical ethicist Professor George Agich, is the end of the story. As long as the prisoner consented, the VHP was not acting unethically in using what they later learned to be an executed body. Where this gets complicated is that the virtue of Jernigan's cadaver lay in its perverse state of fitness. The industrial and scientific value of the VHP is tied inextricably to a system that produces an unmarked corpse in excellent health. After all, Jernigan trumped all those other bodies because he didn't die the way the rest of us do: mangled by accident, riddled by disease, or choked by cholesterol. In other words, you really can't benefit from the VHP without in some way acknowledging a debt of gratitude to the Texas Penal Code. Even with donation, consent, and anonymous selection as moral buffers, we are still brought face to face with the ethics of the death penalty and must decide whether to proceed. In the U.S. it has been full steam ahead. Even Ackerman was surprised by the comp.ete absence of any negative response to the project. Only Jernigan's body responds to this questionable linkage of science and the death penalty, as his much-vaunted "normal" flesh offers a rueful and ironic riposte to his punishment for being bad to the bone. In fact the VHP may well be the last word on the disturbing resurgence of interest in anatomical correlates to criminal behavior.

This theory, proposed by American criminologists James Q. Wilson and Richard Herrnstein, suggests that violence is somehow hard-wired into our body shapes. The choice of a convicted murderer as the healthy body next to which we measure our own is an eloquent and unexpectedly emphatic No-vote to that idea. Whether the VHP is drawn into the murky debates about physical pre-disposition to crime, it is clearly intended to be some kind of "last word" on human bodies. Project imaging specialist Professor Victor Spitzer of the University of Colorado believes that the VHP will provide the standard images of the human body because it is sharable. "This body can move down the information superhighway and end up on various workstations throughout the country."

Joe is set to become an industry standard of sorts, the male of choice for physicians and entrepreneurs alike. The timing is impeccable, coming as it does at the close of a 20-year-long assault in Humanities departments around the world on that particular demographic. At a time when the emergent identity claims of the gendered body, the gay body of AIDS activism, the post-colonial body, and the indigenous body are all demanding space in the public sphere, the VHP looks a bit like damage control, a return of the dead, white male to pre-eminent visibility.

A lot of the media's coverage of the VHP mused on Jernigan's electronic existence in some kind of eternal resting place, as if one way of understanding cyberspace were to think of it as the electronic afterlife of objects. This sense of "crossing over" to the other side is reminiscent of the frontierism that marked the beginnings of the space program. The thrill of getting out there into the hostile beyond where, in this case, Jernigan, doomed cybernaut, is the human equivalent of Laika – the first animal sent into orbit; doomed because technology to return space capsules to Earth had not yet been invented.

A lot of the media's coverage of the Visible Human Project mused on Jernigan's electronic existence in some kind of eternal resting place, as if one way of understanding cyberspace were to think of it as the electronic afterlife of objects.

Locating Jernigan in some kind of Internet-accessible eternity, needlessly hypes the electronic future without acknowledging that we are all routinely making crossings into the datasphere, and living to tell the tale. The way that this raises the technology stakes is a troubling aspect of the project. The VHP is not one of those fascinating interpenetrations of bodies and technology that we keep reading about. Its technology is all behind the curtain and more in keeping with the nature of a special effect. That effect, the presentation of a natural, unmarked body, is as convincing as the extinct Raptors of *Jurassic Park*. We live in an era of prosthetics, of miniaturized machines beneath the skin. The dream vision of the VHP undoes this, sends us back to a moment innocent of hip replacements, pacemakers, metal pins, and internal monitors. This quaintly romantic body, frozen in time and gelatin, is then offered as a blank slate for the computer mouse to manipulate, slotting in bits and pieces, assembling and dis-assembling. Through the VHP we can repeatedly experience the moment when bio-mechanics emerged as a discipline – when the body was understood as a repairable machine, and when metal and plastic first made their appearance inside – with a click. These pantomimes of medical history are offered to us free of charge, at precisely the moment when the real game is moving elsewhere. The location of that game can't be seen on the VHP; it's at the level of the genetic substrate, deep below the crude pumps and filters of the body, where life itself is currently up for grabs, where an entrepreneurial sociobiology is planning new and potentially private visions of the human. Imagine 10 years from now a poignant encounter in cyberspace. Jernigan is being downloaded for the benefit of a high-school science class in Wuhan; in L.A. the code for a genetically altered pancreas is beamed on consignment to Townsville. The data sets flash past each other over the Pacific: 'Meat Man, meet Man.' ■

Visible Human Project sample images can be found at: http://www.nlm.nih.gov This will get you to the NLM home page. Select "Visible Human Project."

KILLER'S IDENTIKIT: The 'average Joe' that the NLM required had to be of average height and weight and free of infectious disease, cancer, tissue deterioration, bone deformation, trauma, burns, and any prosthetics. As they weren't looking to transplant any organs it was of little concern that Jernigan had been executed by barbiturate poisoning.
Left is Jernigan's 1981 prison mug shot and right as a digital image.

OMEGA MAN

PHYSICIST AND SELF-PROCLAIMED HERETIC, FRANK TIPLER, CLAIMS THAT THE DEFEAT OF DEATH – REVELATIONS STYLE – WILL BE ACHIEVED BY SUPER INTELLIGENT MACHINES IN THE FAR FUTURE. THE ENTIRE HISTORY OF HUMANITY WILL BE JOINED AT WHAT TIPLER CALLS **THE OMEGA POINT.** WHILE MANY SCIENTISTS AND THEOLOGIANS EXPRESS "VIOLENT OPPOSITION," TIPLER SAYS HE HAS THE MATHEMATICS TO PROVE HIS THEORY. HERE HE PONDERS GOD, MATHEMATICS, PHYSICS, DEATH AND THE HEREAFTER.

by Nick Marinello Ω Illustration by Greg O'Connor

Photography: Yu Amano

PHILIP MARLOWE, PRIVATE INVESTIGATOR, CALLED IT "THE big sleep." So did St Paul, sort of. "Them that sleep in Jesus, will God bring with him," says Paul, in a bit of apocalyptic prophecy revealed in his first epistle to the Thessalonians. A little theology mixed with metaphysics – and a touch of *film noir*: typical fodder for campus discourse. But it's a dark, sleepy November morning and Lord knows nobody here is thinking of anything beyond breakfast, coffee, and maybe a bleary-eyed look at the comics. New Orleans' Tulane University Center cafeteria has the cozy smell of toast and eggs – like walking into a roadside Denny's or Waffle House after too many highway miles. A student drags in, looking as unmade as the bed he's just rolled out of. Probably doesn't even know what T-shirt he's wearing, much less the slogan it displays across his back: "Life's not too short. It's just that you're dead for so long..."

ACROSS CAMPUS, FRANK TIPLER IS MAKING A FAMILIAR TREK. He's on sabbatical this fall, and much of his on-campus time is spent collecting the mail that piles up in both of his offices – one in physics, one in mathematics. At 6-foot-3, Tipler seems taller than a mathematical physics professor should be. There's a gangly boyishness to his walk, a playfulness in the way his eyebrows arch now and again above his glasses.

"Remember," Tipler says as he enters his mathematics office, "I am guilty of heresy here. As I say in my book, the general opinion is that science and religion should be separate."

If there is a swagger to the way his words hold together, it's because Tipler, perhaps, relishes his role as heretic. Last spring, in his book *The Physics of Immortality: Modern Cosmology, God and the Resurrection of the Dead*, Tipler ventured a series of astounding claims, including the prediction of the existence of God, heaven, and everlasting life for everybody. He says he can prove it all through a conservative application of quantum mechanics, general relativity, and information theory, that he calls the Omega Point Theory. To do so, he says, you must look some million-trillion years into the future to where the Earth is vaporized, space and time converge, the universe collapses into a point, temperature goes to infinity, and life is implemented within computers.

This is "heaven"?

Tipler thinks it might be. "What I sometimes tell people when I want to sum up my theory in an easy and understandable way is to say that what I have done is turn the following assertion into a pure statement of physics: God, a person who has created the universe and who has given us free will, really exists, and, furthermore, He loves us all and will one day resurrect us all to live forever with Him in Heaven."

Put that way, Tipler's Omega Point does jibe pretty well with the Judeo-Christian view of heaven. And there's been hell to pay. If *The Physics of Immortality* has caught the imagination of the general public (it was a bestseller in Germany; it's in its fourth U.S. printing; and translations into Dutch, Italian, Portuguese and Spanish are in progress), it has flared into something of a supernova among theologians who believe science cannot find God, and scientists who believe God simply isn't available to find.

Thus, Tipler's heresy. He thumbs his nose at both camps in his book, writing, "Either theology is pure nonsense, a subject with no content, or else theology must ultimately become a part of physics." A couple of centuries earlier he could have been tied to a stake for such thoughts.

As it is, Tipler is bound to a contract with Doubleday and a book agent who advised him to extract the physics from the main body of the text and include it in an "Appendix for Scientists." The result is an engaging, sometimes moving, book that speculates on the co-evolution of life and the universe.

TIPLER BEGINS HIS BOOK WITH THE FAIRLY COMMON assertion that Earth is doomed to spiral into an ever-growing sun in about seven billion years. If life is to continue, it will need to have already booked passage off *terra firma* and into other galaxies by the time this date with doom occurs. Tipler offers an example of how this might happen, and fans of science fiction may be aghast that he does not rely on the familiar conventions of worm holes, parallel universes, or "warp speed" to accomplish interstellar travel. Mr Sulu is not on board for this trip.

Instead, Tipler takes pains to construct a plan employing technology that is already available or will likely soon be developed. He envisions a program to colonize the stars as soon as the middle of the next century, using robotic space probes to travel to nearby galaxies, construct space colonies, and build the next generation of probes that will colonize out from there, galaxy-hopping as they spread across the universe and using biotechnology to synthesize and nurture the fertilized eggs of any terrestrial species brought along for the ride – including humans. By Tipler's estimation, the Milky Way could be colonized in this manner in 600,000 years. Life will engulf the entire universe, Tipler predicts, in 10^{19} years.

To understand the Omega Point Theory, it is critical to understand what Tipler means by "life.' In *The Physics of Immortality*, Tipler suggests that a living being is "any entity which codes information, with the information coded being preserved by natural selection." Just as humans are "alive," so too, according to Tipler, will be the intelligent machines of the future. Such computers are conservatively estimated to be available in 30 to 40 years. Tipler proposes that in the far future living machines will become more intelligent than members of the species *homo sapiens* and will dominate civilization.

$$I_{human} \approx 2.57686 \times 10^{} \text{ bits}$$

The number of bits that can be coded by any physical entity the size and mass of a human being is described as *i human*.

$$T_{life} = 2\pi/(3\gamma - 1)$$

The theory of immortality: Tipler's equation for the total lifetime of the universe.

"I prefer to think of persons as programs," says Tipler. "It's of minor significance what particular forms these programs are embodied in. We know the embodiment of life has changed enormously over time." Tipler suggests that if humans and chimpanzees shared a common ancestor as "few" as six million years ago, it is impossible to limit the course or extent of human evolution.

Tipler concludes that in order to survive, life must become ubiquitous throughout the universe. Why? Because life has a far greater threat to it than the mere annihilation of the Earth. At about the same time its outer limits are colonized, the universe, which most physicists now believe has been expanding since the big bang, will begin to collapse – suck back into itself willy-nilly in different directions at different rates. If Tipler is right, however, our descendants – because they pervade every galaxy – will be able to guide that collapse, allowing the universe to implode in only two directions while remaining constant in the third. According to Tipler, the difference in temperature between the "hot spots" within the collapsing portion of the universe and the "cold spot" of the stable portion will power life in the far future.

Tipler argues that at this point, life will have access to unlimited energy – or power – and that its control over matter will be infinite at the end of time. He also argues that our progeny, in order to survive, must increase in knowledge, with knowledge becoming infinite at the end of time.

"Notice what is happening," says Tipler, squeaking his chair as he leans forward. "I deduce that life at the end of the universe is omnipresent, omnipotent, and omniscient. Do you see what happens in the far future?"

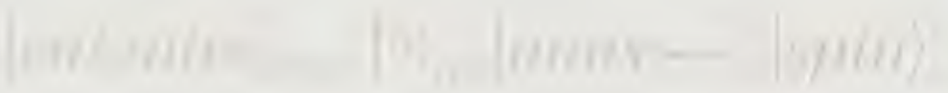
Sure. At the end of time, there is God.

"God is the end of time, pulling the whole of reality into Himself," says Tipler, the poet. Tipler, the physicist, describes God as "the sum total of all information processing over all history." At the end of time, somewhere around the year 10,000,000,000,000,000,000, Tipler figures there will be enough information processing to recreate every person, place, and thing that has ever existed. The entire universe, Tipler contends, will be resurrected as sub-programs within God, inhabiting a virtual reality that will last forever.

"If the universe is globally hyperbolic (deterministic)," writes Tipler, "all the information contained in the whole of human history, including every detail of human life, will be available for analysis by the collectivity of life in the far future....It is possible for life in the far future to construct, using this information, a perfectly accurate simulation of these past lives."

In this "virtual" existence, Tipler argues, we will enjoy new experiences forever, creating for ourselves the ideal world and ascending to higher levels of implementation within the Universal Mind of the far future.

And this, he maintains, happens to be perfectly consistent with the Bible. He refers to the image of Moses standing before the burning bush, asking God for His name. "In the King James translation, God replies, 'I am that I am,'" says Tipler. "But the original Hebrew is *Ehyeh Asher Ehyeh*, 'I will be what I will be' – future tense."



Tipler's equation for the entire universe. The 'cat' is the life form whose fate (immortality or extinction) depends on the outcome of the formula.

FRANK TIPLER DID NOT GO HUNTING FOR GOD. IN AN October 1994 interview with *Omni* magazine, he says his main interest in the Omega Point Theory is the examination of the total of reality and that, as a consequence, "God just falls out." An atheist since the age of 16, Tipler says he had never given much thought to the hereafter. "I pretty much was well convinced that when I was dead, I was dead, and that was the end of it. If I had any reality at all it would be just this segment of it – some 70 years."

But Tipler was intrigued with what would happen after he was gone – way after. Central to Tipler's intellectual jauntiness has been his ongoing interest in global general relativity, which, simply put, is the use of Einstein's ideas and mathematical formulation regarding space-time to observe the universe in the largest possible scales. By calculating the volume of the time-space continuum, Tipler estimates the future of the universe to be at least 30,000 times larger than the past. "Most of reality is in the future," he says.

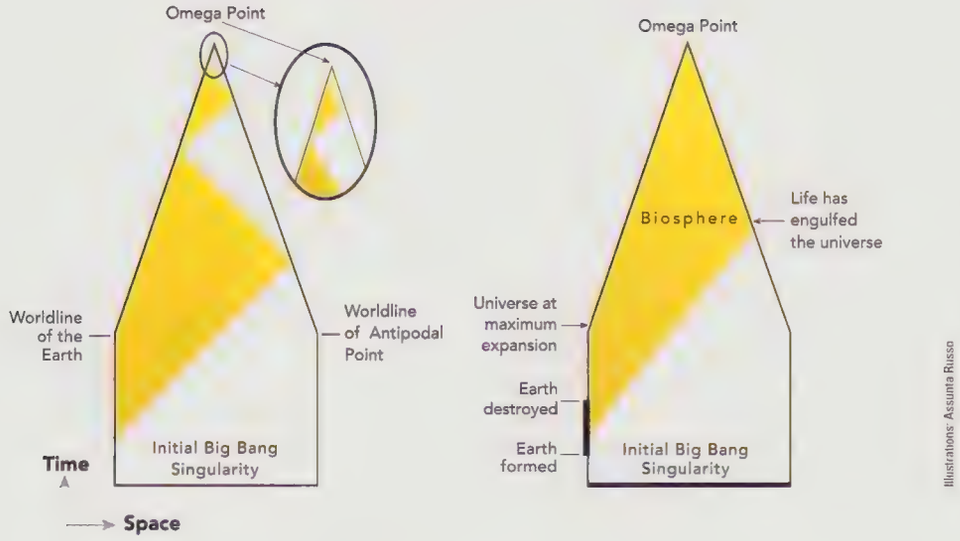
According to Tipler's mathematics, the ultimate future – the very end of time – God – is a singular event that exists on the boundary of space-time. It is the completion of time, but it is not in time. It can be approached, but never reached. And that is another reason, says Tipler, to liken the Omega Point to God. "The traditional theological notion that God is transcendent of time, that He lies outside of time, comes from physics."

IN SEPTEMBER 1988 TIPLER WAS INVITED TO A CONFERENCE honoring the German theologian Wolfhart Pannenberg, in order to present a paper on his Omega Point Theory. He thought it appropriate to acquaint himself with Pannenberg's work.

"I thought maybe I would read some of his papers. His books were too long, and I didn't want to waste time with that," Tipler says. "I was intending to make a few offhanded comments about his work and then proceed with the usual physics."

But a funny thing happened on the way to the conference: Pannenberg's words jarred Tipler's intellect. "I was reading his opinion about what life after death meant in the Christian religion. He described it as living again inside the mind of God... brought back into existence inside the mind of God... recorded inside the mind of God."

Tipler tried transcribing Pannenberg's words into the language of physics and saw an inescapable analogy between being "recorded into the mind of God" and being transferred into a computer. "And I realized almost instantly that – my God – my theory has resurrection built in!"



Illustrations: Assunta Russo

These diagrams illustrate the potential development of the Omega Point.

Left: The light ray (representing entire space time as a single past -light cone) emanating from Earth zig zags between Earth and the antipodal point until the final singularity, the Omega Point.

Right: The thick, vertical black line represents the history of the Earth; the shaded region is the biosphere, which expands into the universe, engulfing it after maximum expansion.

PHYSICISTS HAVE CALCULATED ESCAPE VELOCITY – THE minimum speed needed for a moving body to pull away from Earth's field of gravity. For Frank Tipler, born in small, conservative Andalusia, Alabama, in 1947, the momentum to escape the gravitational pull of a small southern town was acquired early on.

"The image I have is of being on a swing in kindergarten, thinking about these articles I had heard about," recalls Tipler. "I couldn't read then, and television had not penetrated my area of the Deep South, but my father had read me stories from the newspaper about Wernher von Braun."

After surrendering to the U.S. Army in 1945, Braun and his group of German rocket engineers were relocated to the United States and, in 1950, were delivered to the Redstone Arsenal outside Huntsville, Alabama, where they continued their work in rocketry.

"It was a big deal in Alabama because it was the only science we had to speak of," says Tipler. "I remember being fascinated with the idea of space travel, of astronomy." For his first science project, at age eight, Tipler wrote a letter to Braun, asking for a small portion of rocket fuel. (Request denied.)

Reared as a Southern Baptist, the young Tipler read extensively from mathematics, physics and theology texts. By adolescence, however, a conflict emerged. "It was made very forcibly clear to me that the religion I was raised on was inconsistent with science," he says. "I had to reconsider my whole life. I had to decide if I was going to reject religion or reject science, and I thought I had no choice. I rejected religion."

Tipler's aspirations began to take on a vitality of their own. "My life was determined at a very early age. Looking back on it, everything has been sort of a logic of my own position." Tipler explains that his desire to further his scientific education landed him at MIT. Because he wanted to specialize in relativity in graduate school, he studied at the University of Maryland, receiving his doctorate in relativity physics. An interest in global general relativity was the deciding factor in his choosing to join research teams at Berkeley, Oxford and Texas before arriving at Tulane in 1981, where he has taught calculus in the mathematics department and descriptive astronomy, modern cosmology, general relativity, and electro-magnetic theory in physics.

If Tipler's academic background seems diverse, it only scratches the surface of his apparent fund of knowledge. *The Physics of Immortality* might be a book about science, but it is also very much a humanist's tome. Woven into the text, alongside references to Gödel, Heisenberg, Hawking, and Einstein, are citations from Camus, Jefferson Locke, and St Paul.

Tipler is comfortable with the mix. "A secular humanist thinks that science is the only way to understand reality," he says. "As it happens, when the smoke clears, if you have a consistent theory of the universe which takes into account life, you will find yourself, as a pure scientist, deducing that the central tenets of religion are basically true."

There is a strong sense of morality, of empathy to the human condition, throughout *The Physics of Immortality*. In the book's introduction, Tipler writes, "If any reader has lost a loved one, or is afraid of death, modern physics says: 'Be comforted, you and they shall live again.'" The statement might be a solicitation to whimsy if it didn't cut so close to the bone.

"Death is the fundamental evil," says Tipler. "Everything else is trivial in comparison to that." It is not irrelevant that in the book, over and again, Tipler makes reference to the Holocaust. "It epitomizes that evil," he says. "It was a terrible massacre. Systematic killing. So I aimed at that because it illustrates the fundamental evil that I think the theory I am espousing in my book is designed to overcome."

ONLY THE DAY BEFORE, TIPLER HAD BEEN IN OREGON, finishing up the last leg of his American book tour. *The Physics of Immortality* has been widely – and generally favorably – reviewed, and Tipler has flirted with celebrity. Along with the high-profile interview in *Omni* magazine, Tipler was the subject of a 15-minute segment on the CBS show *Eye to Eye*, hosted by Connie Chung.

You get the feeling, however, that Tipler wants something more substantial than his 15-minutes-of-fame. If he's right, remember, there's an entire eternity ahead for all of us. "I think I am making a significant impact intellectually, which is what I was hoping," says Tipler, who is planning a series of technical lectures next year to "prime the pump" as much as possible. "I am going to deliver further arguments, develop the theory even more, and eventually try to persuade my colleagues to start talking about the far future," says Tipler. In fact, he says he's already had some positive feedback. "I've seen the effects (of the book) on my colleagues in relativity. Their initial reaction is very skeptical, but after they start thinking about it they realize the equations are unequivocal – the future is more important than the past."

As far as the larger audience within the popular culture, Tipler admits he is disappointed the book has not sold as well in the United States as it has in Germany. German colleagues have told Tipler that the German people are generally very interested in rational discussions of religion. "Americans tend to be emotional about religion and to be fearful of physics," says Tipler.

And, as Tipler has said, his impact on religion is a by-product of the Omega Point Theory. "I used to only mention resurrection as a trivial aside at the end of a lecture," says Tipler. But for many of his readers, resurrection is the punch line of Tipler's calculations.

It has also been the most controversial. To some, both in religious and scientific communities, Tipler is on a par with the stump preacher who sells "miracles" in exchange for a donation to the collection plate.

"This is an insult to physicists to call this science," said David Schramm, an astrophysicist at the University of Chicago, during the *Eye To Eye* segment. "[Tipler] is trying to sell books. He knows everybody has these concerns about these religious issues. It would be wonderful if we could solve the existence of God, immortality – but we cannot."

"Of course I want to sell books," says Tipler, who hasn't talked to Schramm about his comments. "The more I sell, the more likely it is that the theory will make an impact. By doing this book in a generally accessible way, I get to reach a general audience and I get that scientific appendix on a huge number of coffee tables."

Still, he says he is surprised by the "violent opposition" he has received from some scientists and theologians. On the same segment, Father William Stoeger, a Jesuit astrophysicist, registered his concerns. "[Tipler] is a gifted and competent scientist. On the other hand, he has gone astray, and badly astray, in dealing with these areas of theology and philosophy in scientific terms."

"I think [my theory] challenges their whole strategy," responds Tipler. "What they have done in the past century is try to have a strict separation between science and religion. If you don't use science to understand the nature of God, then He can be anywhere. You could agree with everybody. Science is different. Science is either right or wrong. My theory is either right or wrong."

Which is why Tipler is still a "reluctant" atheist. "The burden of proof is on the theist to establish the existence of God," he says. "This is a new scientific theory, and you should not yet accept it as true." While Tipler believes his mathematics are sound, he knows he would not be the first scientist to overlook a critical fact. He is fond of a quote by Einstein: "Nature conceals her mysteries by her essential grandeur and not by her cunning."

Still, he remains optimistic. "If I am correct, there are seven predictions I have made that can be tested over the next few decades," he says. "As a matter of luck, a month after my book was published in Germany, Fermilab announced the mass of the top quark was where I predicted."

So Tipler must wait. And maybe, during his mortal life, he will see the Omega Point Theory gain widespread acceptance.

If not, perhaps, come the year 10,000,000,000,000,000,000, Tipler can deliver one cosmic "I-told-you-so."

In the meantime, back on the other side of Tulane campus, the cafeteria crew is busy putting breakfast away and preparing for lunch at the University Center. The students have scattered to class as the morning brightens. Time inexorably moves forward.

Tipler's Omega Point

The key: information coding

"Modern physicists, evolutionary biologists and molecular biologists who are concerned with the origin of life have begun to concentrate on one key definition of life as something that codes information, with information preserved by natural selection."

"Once we focused on life being information processing, I could define what I meant by life going on forever; from now until the end of time, information processing and storage just has to keep going [and] if we look at the amount of information stored and processed between now and the final state, it is infinite."

Controlling the universe

"Life on this planet must become extinct at some point in the future if it's based on our particular form of material. If life tries to remain in the current substrata – that is, DNA carbon-based machines – then it will become extinct when the Sun leaves the main sequence in about five billion years."

"Ultimately life must leave this planet if it is going to continue to survive forever; it must engulf the entire cosmos. In the very far future the entire universe would be converted into one living being. To survive, life must gain control of the whole universe."

Infinite knowledge: the Omega Point

"It is possible, near the final state, for life to manipulate the universe in such a way that event horizons cease to exist. It will mean that the final singularity, the end of time for this closed universe, will have to consist of a single point. I call this point the Omega Point. "

"At the instant the Omega Point is reached, life will have gained total control of all power in the universe. It will have literally infinite knowledge stored. This would be the most optimistic view which you could take of the future of life. It means that our actions now actually have significance: that our civilization will never die out; although our species will eventually become extinct, our ultimate descendants, our 'mind' children, ultimately will engulf the universe, growing to infinite knowledge and power. Can you imagine anything more optimistic?"

Resurrection

"If the Omega Point Theory is true, and our descendants keep going forever, and the computer capacity of the universe diverges without limit, then a day will come when it will be possible to resurrect every being that has ever lived and grant them what amounts to eternal life in an environment which they would enjoy immensely."

"If we had a sufficiently powerful computer, then it will be possible to make an absolutely perfect simulation of every person that has ever lived, and the entire visible universe as it now exists. You will die, and the copy made of you in the very far future would have your memories the instant before dying. Now it might be that you're a very aged person, your mind and your body has started to go. Beings of the far future [could] reproduce you in that state, and then correct the previous errors."

"The far future will be a wonderful place for us. We will be raised up and granted – and you can go through the mathematics and show this – true immortal life."

Interview by Robyn Williams.

FRANK TIPLER'S BREATHLESS DESCRIPTIONS OF HIS OMEGA POINT THEORY HAVE, NOT SURPRISINGLY, DRAWN THEIR SHARE OF CRITICS. AMONG THEM IS PROFESSOR JOHN POLKINGHORNE, PRESIDENT OF QUEENS COLLEGE, CAMBRIDGE. A PHYSICIST AND ANGLICAN PRIEST, POLKINGHORNE, WHOSE OWN VIEWS ARE PRESENTED FLEETINGLY IN TIPLER'S BOOK, IS CONCERNED THAT IN ***THE PHYSICS OF IMMORTALITY*** THE AUTHOR IS MIXING A NOSTALGIA FOR DEEP SOUTH BAPTIST RHETORIC WITH SCIENCE FICTION.

Immortal COMBAT

by Robyn Williams

Robyn Williams: *Having read* The Physics of Immortality, *what did you think of it?*

John Polkinghorne: I thought it was a very ingenious piece of science fiction, but I don't think it was very persuasive in relation to its main purpose. First of all it treats human beings as if they are simply computers made of meat. If we were computers, then of course you can run the software on any sort of hardware you like, and it's Tipler's idea that we should all be re-run at the end of time in some vastly energetic universal computer. I don't think human beings are like that. I think we are something more subtle and interesting than that.

Secondly, it is fantastically ingenious but amazingly speculative. He talks with enormous confidence about the last fraction of the universe's existence. Things begin one over one with ten thousand million zeros which is really a pretty small number and we have not the slightest idea, scientifically, about how matter behaves in that area.

Finally, it depends upon intelligence somehow being ever so benevolent and wanting to take an interest in you and me and restore us, and it seems to me that what we know about human intelligence is not so unambiguously encouraging in that respect. So it's a fun read, but I don't think one should take it too seriously.

Would it be theoretically possible, given infinitely fast computers and almost a limitless supply of energy, to recreate John Polkinghorne?

I'm not sure that it could be done, because I am not sure that the pattern that is me is so simply describable in a way that you could write a recipe for re-assembling me. I think that God could do it, and I think that God would do that, because I do believe in a resurrection or life beyond death. But I think that's a divine power, and not a sort of Promethean human power.

If it were possible through physics, would you feel that you were there, back in that body, recreated after a billion years?

If it really was the pattern that was me – which is what I think the soul is – the very complex pattern that we are, I think it would be me, but I just doubt the ability of any creature, however complex, to do that.

Because if you didn't think you were you, the whole thing would be pointless from your point of view.

It would certainly be very strange to be told that you were somebody that you didn't think you were, I agree.

Does Tipler actually point out whether you would be resurrected in that state as a 20 year old, or as a person you now are?

He doesn't, as I recollect it, discuss that particularly. I think he believes that the whole of my history would be recapitulated and no doubt extended. In fact that's something that early theologians used to speculate, when we are resurrected, what age will we be? Their conclusion was that we would be 30, because that was the age of Christ when he was resurrected. I'm not sure that I believe that.

A world of nothing but 30 year olds.

It does sound slightly boring I must say.

But when it comes to the question of time and God in Tipler's book – when you get to Point Omega, the contraction of everything – then God necessarily will be part of that. Does that idea compute with you at all?

I think that Tipler's God is such a fleeting, final instant that he is really not worthy of being called divine. I do think that time is a real thing, and that we live in a world of true becoming. Time is not an illusion and I don't think that the future, for example, is up there waiting for us to arrive. We make it as we go along. If that's the way things really are then, of course, God, who knows things as they really are, must know us in time; He must know the succession of events, and experience the succession of events, and if the future is yet to be known, I don't think even God can know it.

Would many of your religious colleagues agree with you on that?

No, they certainly wouldn't. There are quite a number of us who think this way, but I think that we are probably a minority and there are certainly people whose theological opinions I very much respect who would not take that view.

Because it's suggesting that God is not omniscient.

That's what would worry them. I think that God is omniscient in this sense; that God knows all that can be known. But at the present no one can know the future, because the future isn't there to be known. I think that when God created the world, he allowed the world to be itself, except with some restrictions both on what He can do – He allows us to do what we choose to do – and also what He can know.

It makes one wonder whether God in that definition is part of this universe, because if He were separate from time and the universe, then there wouldn't be this problem.

I would want to say both things about God. I don't think that God is part of the universe because, for example, I think the universe is going to die, and I don't think God is going to die. So there is a part of God that is independent of time, which is truly eternal in that special timeless sense. But I think that God is involved in time, there is a temporal aspect of God as well, because God interacts with his creation. So I want to have it both ways.

But how can you justify that from your present knowledge of both physics and theology? Aren't you simply demanding something which at the moment cannot be backed up?

If you are going to take broad metaphysical views about the nature of God, and how God relates to the world, or the non-existence of God, or whatever it may be, you are going to have to make some fairly bold conjectures. None of us have access to certain knowledge. What you have to do is make the best sense of what you know and that will, for me, certainly include taking science seriously and taking religious experience and insight seriously. Putting those two together leads quite consistently or coherently to the sort of idea of a God partly outside time and partly inside time, which I am seeking to defend.

How is that God affected by the big crunch? Tipler deals with that in the Omega Theory and includes God. How do you see God being affected by the end of this particular universe?

It will be the death of the universe, and God will, because He cares for His creation, allow the universe a destiny beyond His death, just as I believe we will have destinies beyond our deaths. He will bring that about by some great new creative act, which, as a Christian, I believe has actually already begun in the resurrection of Christ. So God will take that seriously, but He has not been defeated by death and He has not been defeated by the big crunch.

You're a priest as well as a physicist, and head of a college. What about Tipler, you know him personally, does he have any background which makes you wonder about his writings on God and physics?

I'm intrigued by Frank Tipler because he comes from the Deep South and the land of the Southern Baptist, and he seems to want to recapture the sort of religious – the old time religious – language, which may have been the language of his youth. But he wants somehow to realize it in terms of this rather science-fictional picture of the world. I respect the desire but I think he has gone about the wrong way of achieving it. ■

IF THE NEXT GREAT QUAKE IN JAPAN HITS TOKYO, IT COULD REPRESENT YEAR ZERO FOR JAPAN'S FINANCIAL MIGHT.

THE SHOCKWAVES WOULD HIT EVERY STOCKMARKET IN THE WORLD.

ADAM L. PENENBERG

Additional Research in Tokyo
KEN BELSON

Illustration by
NORM ROBINSON

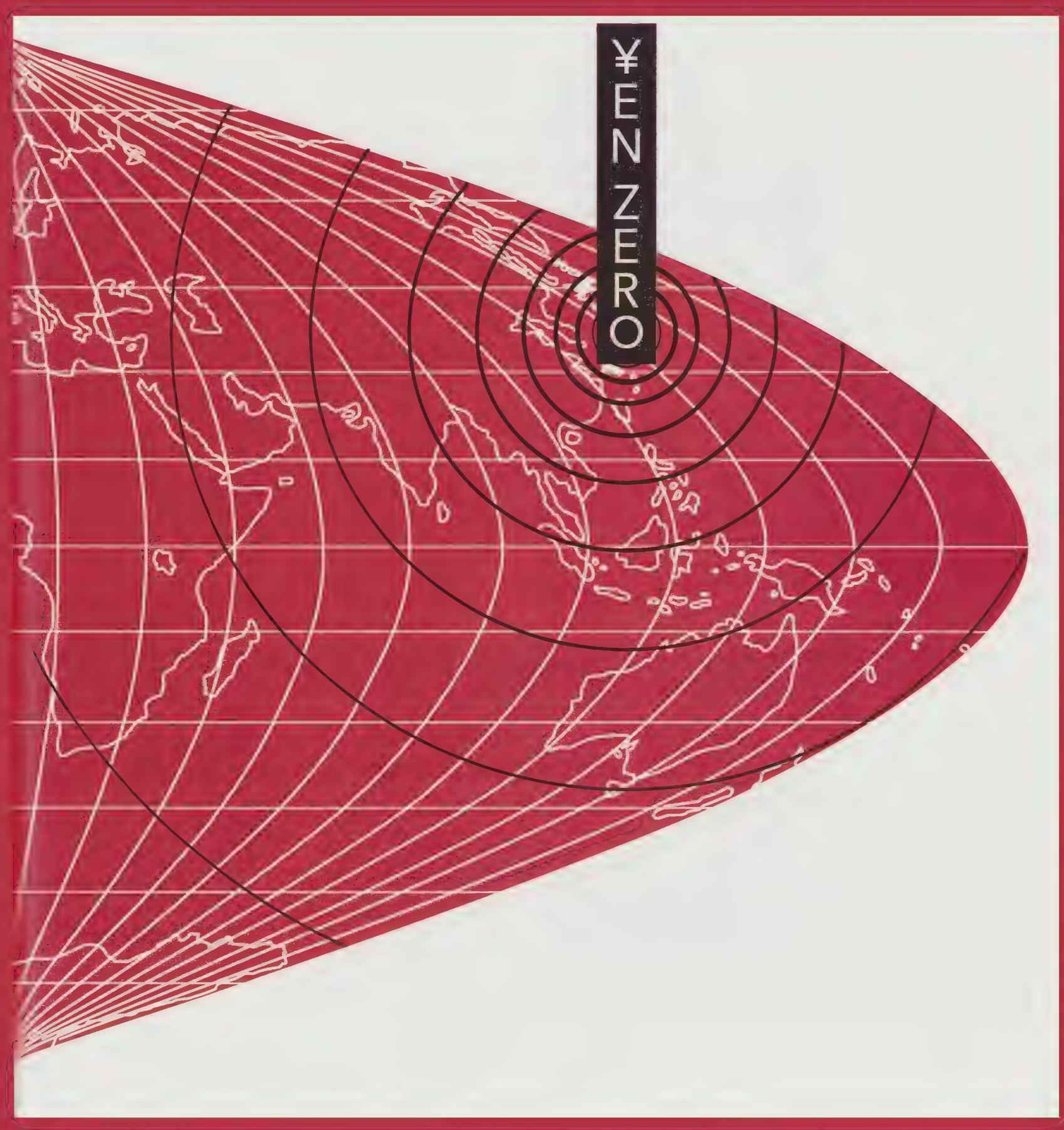

¥EN ZERO

Photo Yamaguchi/ Sygma

THE QUAKE'S WAKE: Predictions vary wildly on the potential casualties of the next major quake, from one Tokyo City government study of 10,000 casualties to a 1988 Japanese National Land Agency study estimating up to 152,000 dead. The 1995 Kobe earthquake killed over 4,000 people.

Photo Hashimoto/ Sygma

FALLING DOWN: All high-rise buildings have steel frames. Although girders are flexible to a point, interior glass and masonry can crack. A large quake can sever horizontal beams from columns, or kick the building off its foot as happened to this Kobe building.

Photo Garner/Rex /Austral

JAPAN DERAILED: Amid the damage sustained by Kobe in the '95 quake, roads and railways collapsed. If a major earthquake hit Tokyo's railway system, including Tokyo and Shinjuku stations through which two million commuters travel each day, disaster would be inevitable.

HIDEAKI KODERA SAYS HIS FIRST THOUGHT WHILE WATCHING NEWS COVERAGE OF THE GREAT KOBE QUAKE OF 1995 WAS, WHAT IF IT HAD BEEN TOKYO?

Kodera, chief representative of the New York branch of the Chukyo Bank, isn't the only one haunted by this gloom and doom scenario. Over the past three-and-a-half centuries, Tokyo has been assaulted by Mother Nature's shakes approximately every 70 years – 1633, 1703, 1782, 1853 and 1923. And the question remains: What *would* happen if a quake the magnitude of the Great Kanto Quake of 1923, which killed 140,000 people and shattered Japan's economy, were to rock modern Tokyo, the heart and soul of "Japan Inc.," with its 12 million people (40 million within a 100-mile radius), nine-and-a-half million buildings; its thousands of factories, department stores and storage facilities; its spiderwebbing transportation network; its millions of homes constructed out of little more than paper, wood, and rice mats?

Risk Management Systems (RMS) of Menlo Park, California, a private company sitting on the other side of the Pacific Rim, claims it has the answer. By plugging in data such as known faults, characteristics of these faults, soil conditions, residential and commercial construction materials, location of factories, and population density, RMS estimates 60,000 would die, up to 100,000 would be seriously injured, there would be $US 1.2 trillion in damage, and between $US 500 million to $US 1 trillion in business disruptions.

But those are just abstract numbers. The reality would be hell on earth. According to numerous sources, within two minutes of the initial shock, a million buildings might collapse and the streets of Shinjuku, one of the city's major business districts, would be buried under two meters of shattered skyscraper glass. One quarter of Tokyo's land, including the famed Ginza shopping streets and Kabuto-cho, home of the Tokyo Stock Exchange, is composed of soft soil that would liquify. Tokyo and Shinjuku stations, which two million commuters shuffle through each day, would collapse, and Tokyo's vacuum-packed trains, made more crowded by the ubiquitous white-gloved "pushers," would topple over on their tracks.

The even-softer reclaimed land kissing Tokyo Bay, where much of the city's gas, oil, and chemicals are stored – an area known grimly as "The Poison Necklace,"– would alchemize into toxic jelly. The result would be explosions on a mephistophelean scale with poisonous elixirs spewing into the bay and into the city. Then there would be the raging fires, poetically dubbed "The Blooms of Edo" by survivors of the 1923 quake, which would engulf whole neighborhoods and dye the night sky a deeper, darker squid-ink black.

And if you think Tokyo – with its 21st-century veneer, a place renowned for its hi-tech cellular phones, fax machines, three-storey-tall video screens, heated toilet seats, and endless supply of neon – is less vulnerable today than it was in 1923, think again. Seventy-two years ago, 70 per cent of Tokyo's buildings were constructed out of wood; today, it's 85 per cent, most of them crushed together in cramped residential areas.

"It would be absolute chaos," says Debbie Hall, RMS project manager. "Millions of people would be pouring out of buildings, but where would they go? Tokyo doesn't have many parks or large open spaces. And then there'd be the fires, which would be an even bigger problem than in 1923. We estimate that 40 per cent of the trillion-dollar-plus damage would be as a result of fire damage."

The economic impact could be equally disastrous and most definitely not confined to Japan. Although the Kobe quake, with estimated damage of roughly $US 130 billion, had little impact on world financial markets, Kobe's population is only one-tenth that of Tokyo, where a quarter of the nation's population is stuffed onto less than 4 per cent of the land. Kobe represents a fraction of the economic activity of Tokyo, which houses two-thirds of Japanese businesses worth more than $US 40 million and where one-third of everything sold in Japan is bought.

According to the Tokai Bank, the net global result of a major Tokyo earthquake would be higher interest rates, recession, and the collapse of America's, and much of the world's, stockmarkets.

Kodera agrees. "I wouldn't want to be an American when the big one hits Tokyo." Talk to your average stockbroker or investment banker, however, and you'll hear a different tale. They'll tell you the Japanese have been selling off their foreign assets for five years now, since their economic bubble popped. They'll spit out statistics like Japanese holdings of American real estate totalled $US 77 billion during the '80s, but plummeted to $US 46 billion by the end of 1994. Or in the case of stocks, the Japanese bought a net $US 52 billion worth of foreign securities in 1993, compared with an average of $US 113 billion per year between 1985-89. In the 1980s they made up 30 per cent of the American bond market. Today it's just 10 per cent. Nevertheless, since Japan continues to run mammoth trade deficits with the U.S. – to the tune of $US 140 billion last year – most of those dollars are recycled back into the U.S. economy, according to R.Taggart Murphy, author of the forthcoming book, *The Real Price of Japanese Money*

Instead of these dollars being invested in 30-year treasury securities, as they were in the '80s, and which lost half their value, this money is being plowed into short-term lending to American banks. The result: "The funding of the U.S. deficit is now hostage to Japan's monetary policy," claims Akio Mikuni, head of Japan's only independent credit agency. And to be sure, Japanese monetary policy would change drastically if the government had to pick up a trillion-dollar cleanup and reconstruction tab.

So for public consumption, investment bankers and stockbrokers render statements like, "If this were 1985, then concerted selling on the part of the Japanese might collapse America's economy, but it's not a major threat today." Or, "Currently, Japanese institutions have very low weightings in foreign assets, thus, there isn't too much to sell."

But what is said off-the-record is entirely different. One of these same bankers, a vice-president at Merrill Lynch, said: "If a major Tokyo quake caused more than a trillion dollars in damage, yeah, sure, it could conceivably crash the stockmarket and produce panic."

Why the about face? Because bankers, brokers, and government officials all have a vested interest in keeping earthquake scenarios shrouded in secrecy.

After insistent prodding, the Merrill Lynch banker, who admitted that a trillion-dollar price tag could send tremors through U.S. markets, said: "I can't tell my clients to divest their portfolios because there's a 40 per cent chance there's going to be a devastating earthquake in Tokyo in the next 30 years. What would they do with their money then? What would happen to the financial markets?"

Even RMS, which got into the earthquake projection business at the behest of more than 100 insurance companies around the globe (the study was funded by Aetna Life and Casualty, and investment bank Salomon Brothers), has begun strumming a different riff lately. At first, Dr Haresh Shah, the Stanford University civil engineering professor who invented the software model for predicting the earthquake scenario, was quoted last year in news accounts as saying: "The effect [of a major Tokyo earthquake] would be massive and worldwide." And added, "Think about it – a trillion dollars or some large fraction of it coming out of [the American] economy. It's going to create massive problems."

Today, RMS officially foresees only a modest economic impact. Scott Belser, an economic consultant to the project, who says he shares the same views as the American Insurance Group (which assisted him in formulating the economic portion of the model), thinks there would be "some decline, but not a crash, in U.S. equity markets." He predicts interest rates would shoot up between 5 and 10 per cent, which he says could put the brakes on American economic growth but wouldn't devastate the U.S. economy.

Although it's hard to quibble with the company's estimated earthquake damage assessments, Belser admits RMS didn't factor key economic data into its model. It's true that Japan boasts one of the world's highest savings rates, which investment bankers are only too happy to point to as a reason why Japan could afford to pay for earthquake reconstruction without resorting to a foreign-assets fire sale. It's also true that the Japanese banking system is teetering on the brink. Billions of dollars in bad loans, brought on by a vertiginous drop in real estate values, a g-force drop in stocks and bonds, and a chronic recession, have yielded an alarming increase in bankruptcies.

Japan has always thought of America as its earthquake insurance.

"It's true we didn't calculate the Japanese savings rate or the impact that debt will have," Belser says. "Japanese bank debt is a big problem. The government would intervene, no doubt, although the lesser-known regional banks might be left to fail. They may be in big trouble." Then, apparently annoyed, he added, "What, are you a spy or something?"

In addition, the Japanese government, in an attempt to stimulate their moribund economy, is running gargantuan budget deficits, to the point where the Japanese government's red ink runs redder than America's. That means there's precious little excess capital bouncing around Japan's capital.

Lastly, RMS didn't have the recent precedent of the cost of reconstructing Kobe, of which 80 per cent or so of the total will fall on the bony shoulders of Japan's government.

Tokyo-based journalist Peter Hadfield, author of *Sixty Seconds That Will Change the World*, a book analyzing the potential global havoc that could be wrought in the event of a massive Tokyo rumbling, claims a trillion-dollar price tag for reconstruction is well beyond Japan's ability to pay these days.

"They can pay for the Kobe quake, although the government has admitted that it is having an effect on the economy," Hadfield says. "It's also running up more of the fiscal deficit. If it had to cope with an earthquake that is going to cost 10 times that much, I think they would have to start bringing some money back. Even the thought of that happening would cause financial panic."

If American interest rates increase, which Belser predicts, then the American recovery would slow to a halt. "That would have a major effect in other countries, like Canada and Mexico, and then in Europe," Hadfield insists. "The whole thing could snowball. It takes very little of a trigger in economic markets these days to have an effect around the world."

Another Merrill Lynch investment banker, who also insisted on anonymity, says, "If a blip in the Mexican economy could cause the dollar to fall so drastically as it did recently, I shudder to think what a catastrophic Tokyo earthquake would do."

Ironically, in the long run, the country that would stand to gain the most from a devastating Tokyo earthquake could be Japan itself. It would do wonders for the nation's yawning trade surpluses with the rest of the world. Since it's a foregone conclusion that much of its manufacturing base would be destroyed, shrinking its export capacity, and the nation has little in the way of natural resources, Japan, in order to reconstruct, would change its credo from "Export or die" to "Import to thrive."

The frenetic drive to build would mean robust economic growth. The Tokai Bank estimates the post-earthquake economy would grow at 12 per cent the first year, then 14 per cent the following year, in striking contrast to the punch-drunk economies of the United States, Europe, Australia and Latin America, which would be reeling. This, on a much smaller scale, is what economists like Jeff Young, who works with the Tokyo office of Salomon Brothers, predict will be the result of Kobe reconstruction. A "V-shaped" recovery, they call it.

This cycle of birth, growth, death and regeneration is not new to the Japanese. The Great Quake of 1923 marked the end of Japan's first Economic Miracle (1867-1923). The atomic bombs dumped on Hiroshima and Nagasaki put an end to Japan's colonial aspirations. The bursting of Japan's economic bubble over the first 10 months of 1990 spelled the finale of the nation's post-World War 2 growth spurt. Perhaps the next trembler to hammer Tokyo will be the topper.

But how do the insurance companies figure in all of this? Aren't they the ones who would foot the bill when the big one rumbles into town?

In the case of Kobe, Japanese insurance companies will end up paying a scrawny 2 per cent of the damage, or roughly $US 3 billion, with much of that diluted by sharing the burden throughout the global reinsurance industry. RMS estimates that in the case of a mega-quake in Tokyo, the Japanese insurance industry would be obligated to front $US 50 billion – a mere coffee stain on their global balance sheets.

There are many reasons for this. Earthquake insurance is prohibitively expensive, so few opt for it. Kodera says he can't afford earthquake insurance for his modest home in Japan because the annual premiums exceed $US 35,000. Only residences in Tokyo are eligible for earthquake coverage, and by law, coverage is capped at 15 per cent of the total fire insurance coverage, a residue of the 1923 Tokyo quake when Japan's insurance industry was saved only by governmental intervention.

In addition, earthquake insurance regulations are byzantine in their complexity and, unsurprisingly, weighted heavily in favor of the insurance industry.

"If more than 50 per cent of a house is destroyed, and you have earthquake insurance, you're totally covered," Hall says."But if damage is between 20 and 50 per cent, they'll only pay back a fraction and a lot less if the damage is deemed less than 20 per cent."

The money to rebuild, then, would have to come from elsewhere. But where? Belser says the Japanese government could do one of two things: either get out the printing press and manufacture money, or borrow from abroad. It seems unlikely that a nation that's been allergic to inflation since the close of World War 2 would choose to churn out money, and, with the government running so much red ink these days, it's also unlikely that it would find borrowing from foreign banks palatable either.

According to Tadashi Ito, chief representative for the Chiba Kogyo Bank in New York, the funds for reconstruction would come from across the Pacific, because "Japan has always thought of America as its earthquake insurance."

the richter scale vs the japanese quake gauge

A humongous earthquake far away is preferable to a small one nearby. This is where the Richter scale fails, since it describes the amount of energy released as measured at the epicenter, not the resulting damage. Since Richter's scale is logarithmic, each point means an exponential increase in energy generated, so there's a significant difference between 6.9 and 7.0, for example.

The Japanese are more pragmatic in their approach to earthquakes and have developed a handy earthquake scale based on the amount of shaking. Think of an earthquake as a light bulb: the Richter scale tells you the bulb's wattage; the Japanese scale tells you how bright it is in every nook and cranny in the room.

THE JAPANESE SCALE:

0 Magnitude = a piddly tremor. More like an earthquickie.

1 Magnitude = a tiny tremor only noticed by people standing still.

2 Magnitude = picture frames and lamp shades quiver. No big deal.

3 Magnitude = doors and windows rattle. If you're asleep on a futon it feels a little like "magic fingers."

4 Magnitude = scary if you're in a high-rise building. Loose items fall over; people race out to the street.

5 Magnitude = now we're talking. Some buildings and houses suffer cracks and fissures. Glass can shatter. Watch out for falling plaster and bricks.

6 Magnitude = violent enough to destroy up to 30 per cent of houses. The ground sways, so it's hard to walk.

7 Magnitude = an earthquake severe enough to wipe out more than 30 per cent of housing; can cause landslides and open up gaping cracks in the ground.

8 Magnitude = time to move somewhere else... fast.

how does your building stack up?

WOOD: Wood-frame houses offer some protection in an earthquake but are much more likely to burn afterward. Unless tied down, such buildings can jump off their foundations, leaving part of the building sagging.

BRICK: If you're inside, you're lucky, since bricks always fall outward in a quake and the interior wood-frame and floors often remain intact. The building's exterior can suffer cracks and lesions, which may look bad but actually perform a service, since the cracks help dissipate some of the quake's fury.

CONCRETE FRAME: Hotels, apartment complexes, and highways are often made out of concrete poured over steel reinforcing bars. If you're lucky, the steel will twist with the ground and the cement will absorb much of the shock. But if the building hasn't been reinforced lately, the concrete can blow out and the frame can collapse. Pre-1976 buildings are a much greater risk.

STEEL FRAME SKYSCRAPERS: All high risers have steel frames. Although girders are flexible to a point, interior glass and masonry can crack. A nasty enough quake can sever horizontal beams from columns, or kick the building off its feet.

KYOKO OKAMOTO HAS ROTTEN LUCK. THEN AGAIN, SHE MAY HAVE GREAT LUCK.

In the Great Kanto Earthquake of 1923, her house collapsed and Okamoto, then 10 years old, squirmed out of the wreckage and fled to safety as waves of flame surfed in. She was lucky she didn't seek safety in Hongo Park, where 60,000 people were burned alive by a cyclone of fire. For more than a month afterward, she and her family lived in their cramped yard, amidst the charred rubble, eking out survival. Seventy-two years later, Okamoto was sleeping alone in her Kobe home when her bedroom shuddered, the altar she slept near keeled over, and a chest of drawers plonked her on the head. She was rescued by a neighbor and, bleeding and losing consciousness, was hospitalized.

"Why do I have to suffer this?" Okamoto was quoted in the *Yomiuri Shimbun*. "I resent my fate. Perhaps I've lived too long."

Considering the number of casualties in both quakes, Okamoto may be one of the luckiest people alive, a freak of statistics, as rare as those who are struck twice by lightning or who survive not just one, but two, plane crashes.

But the reason for her suffering is due less to her advanced age than to the Japanese national obsession with trying to domesticate nature. On a micro level, this is manifested in sparsely beautiful gardens, trimmed with bonsai trees trained with copper wire to produce exotic shapes. On a macro level, the land-starved nation has maintained a policy to reclaim land from the sea, a place to plant factories, offices, and storage tanks, in order to keep the export machine well-oiled and running smoothly. Japanese often say they are connected with nature in a way impossible for Westerners to comprehend. Earthquakes, floods, monsoons, tidal waves, typhoons, volcanoes, they are all an essential part of nature and the Japanese psyche. In fact, there's an old Japanese saying: What do Japanese fear most?: *Jishin, kaminari, kaji, oyaji* ("earthquakes, thunder, fire, and father."). There's another saying, perhaps more apt, usually issued with a faint shrug: *Shoganai*, or What can you do about it?

As a result, instead of, say, moving the capital to safer ground, something that's been bandied about for years without action and which would entail uprooting 55 per cent of the nation's corporate head offices, vast bureaucracy, and government, the nation has spent billions on "earthquake-proofing" buildings, investing in gadgetry like active mass drivers – huge ball bearings that careen around a building in the event of an earthquake in order to achieve constant equilibrium – and foundations that their manufacturers say can bend and sway with the dancing earth so that skyscrapers can hula without crashing to the ground. Highways and bridges are constructed out of reinforced concrete. One hundred million dollars a year is budgeted by the government for earthquake prediction, which most seismologists agree is as accurate as reading tea leaves or consulting a psychic.

Besides, what does the government care if an earthquake levels Tokyo? Most government offices (and the Emperor's Palace) are located on the little solid rock that Tokyo has to offer. When the big one comes, government representatives, bureaucrats, and the Emperor may be shaken and stirred, but they'll live.

Every September 1st, on the anniversary of the '23 quake, Tokyo residents observe national Disaster Prevention Day. Schoolchildren prance around, handkerchiefs cupped over faces, and dash under desks. Fire departments across the country take earthquake simulation machines out of mothballs. Garnished with a bookshelf, gas stove, kerosene heater, table and two chairs – standard furnishings in a nation devoid of central heating – these room-size boxes are set on shock absorbers and at the flick of a switch shudder madly. The participant is instructed in the tricks of quake survival: turn off the stove, open the door, hide under the table. It's like a game show. And for the most part it's useless.

"Most of the fires in the Kobe quake were caused by ruptured gas mains, not from homes," Hall says. "In fact, 70 per cent of Kobe homes had auto-shutoff valves. It was the gas mains that blew. Spontaneous combustion fires were set off as much as two days after the quake."

So the fact remains: Tokyo sits on four of the Earth's 12 fault plates, and is a sitting, trembling duck. This is made even worse by the existence of an additional type of random phenomena known as intraplate earthquakes, which no one fully understands and no one can predict. Indeed, the list of those who survive two crushing quakes, like Okamoto, will probably grow significantly.

Even after the emotional drubbing and confidence-shattering result of the Kobe quake, Japanese officials contend they are prepared; that the nation has the most rigorous construction standards in the world. Nevertheless, as recently as 1991 only 9 per cent of Tokyo-based businesses backed up their data in order to be able to keep track of who owns what in post-quake Tokyo. And according to Hadfield, if Kobe is any barometer, this means serious trouble.

"In Kobe, a lot of the buildings were very old, so that's what caused the damage, but then we have the same in some areas of Tokyo," Hadfield says. "What concerns me is the way construction companies get around building codes. In an earthquake we see skimpy and shoddy workmanship come out. And, of course, that has happened in numerous instances: faulty welding, bad concreting, and a mix of materials, all of these things that are against the building codes but which were done by the construction companies because it's cheaper."

"They shouldn't be preparing for if they happen, they should be preparing for when they happen."

This view was recently echoed by Minoru Hirano, a Japanese highway designer and director of project planning for the Japan Highway Public Corporation, who, when an elevated highway in San Francisco collapsed in 1989, claimed that Japan's bridges were stronger.

But after Kobe?

"I didn't think it could happen to Japan. I thought our design code would be enough," he told *The New York Times*.

Another serious problem in the Kobe quake was with bureaucratic inertia, which is normally manifested in the laborious trade talks Japan conducts with its trading partners. The net result was a stunning inability to cope with the crisis.

The Japanese Prime Minister, Tomiichi Murayama, admitted to the media that he had only learned of the disaster when he happened to turn on his television for the news. Fourteen desperately needed crates of donated Tylenol pain reliever were stashed in warehouses because the medicine is not licensed for sale in Japan. Health officials insisted that the dosage might be inappropriate for Japanese bodies, which sounds a lot like the argument the government used to give when declaring foreign beef off-limits for import, "because Japanese intestines are different."

Foreign physicians were first told they couldn't treat patients in Kobe until they received proper licensing, although the Foreign Ministry ultimately intervened. And the French Government, no stranger to bureaucratic stumbling and bumbling, sent over specially trained dogs to help sniff out victims entombed in the rubble, but the Japanese Agricultural Department insisted they be put in quarantine. Eventually the dogs were allowed in – four days after the quake hit, although by then it was too late for them to do much good, since the nine people they located were already dead.

Hadfield also predicts that in the event of a major Tokyo-region quake, there would be a severe water shortage, which would enable fires to burn uninterrupted for days, as was the case with Kobe.

JAPAN'S STRATEGIC DEFENCE INITIATIVE

Every year, the earth shakes, rattles, and rolls 100,000 times. Fortunately, most of these earthquakes are relatively inconsequential, causing little damage and few injuries. Seismologists estimate that about once every two days – or 150 times a year – a quake in the 6-6.9 range hits some place on the globe. Rarer are quakes in the 7-7.9 range, which strike between 12 and 24 times a year. About one quake a year tips the Richter scale at more than 8, equalling the energy generated by 27,000 Hiroshima-sized atomic bombs.

Since a full 10 per cent of the world's earthquakes occur in the land of the rising sun, it's no surprise Japanese have an obsession with predicting the potential damage of the next *dai jishin*, or big quake, to pummel Tokyo. And these studies vary wildly in their predictions, from one Tokyo city government study concluding that there would be only 10,000 casualties, to a 1988 Japanese National Land Agency study estimating up to 152,000 dead and 205,000 injured. But since the Risk Management Systems model is based on the most comprehensive data available, it is the most accurate projection to date.

To fight the wrath of nature, Japanese engineers use more steel in constructing their buildings than their counterparts in other nations. American engineers, ironically, have opted for more of an aikido-style: buildings are designed to be flexible, to move in tandem with the earth. Thus far, it's difficult to say which is more effective, although in the recent Kobe and California quakes, generally speaking, newer buildings, constructed after 1980, held up fairly well.

In Japan, many of the nation's newer skyscrapers have been constructed on rubber foundations, like shock absorbers on a car, allowing taller buildings to do the hula, lambada, maybe even the tango, but definitely not the limbo. The trend today is toward smart technology, designed to control rather than resist a tremor's oscillations. The idea is to outfit buildings with an extensive network of sensors that detect motion, then react nanosecond to nanosecond to the thrusting, tossing, and turning of an earthquake. In essence, the building strives to remain in constant equilibrium.

To date, smart-technology engineers have concocted three ways to combat the shakes: huge weights that slide back and forth on a track to keep the building in balance as it sways; flexible cables or braces that span the length of the building to keep it centered; and Star Trekkian jet thrusters, powered by water or compressed air, that work to counteract shuddering.

With each method, the sensor network carries information from seismic vibrations to a computer, which analyzes the data, then commands the weights, braces, or thrusters to respond accordingly. But most experts admit this kind of technology, which may not even be able to handle larger quakes, is years away. Ironically, it's the low-tech aspect of the technology that offers the most significant problem, namely mundane breakdowns like bursting cooling hoses. And since the control systems could sit idle for decades, it's likely that when called upon to act, they will probably fail. In addition, these systems would have to be able to function even when power is knocked out.

One decidedly unglamorous low-tech option is to reinforce bridges, highways, and buildings with extra steel, and wrap support pylons in kevlar bandages, which greatly increase their resistance to quakes. The general rule of thumb for gauging the success of earthquake engineering is this: If after a mega-quake a building is still standing, then the engineers did their job.

"I heard that when the chairman of Toyota was asked why his company wasn't better prepared, he replied that 'it's impossible to be prepared for the unexpected.' It's ridiculous for anyone in Japan to say that earthquakes are unexpected," Hadfield says. "They shouldn't be preparing for *if* they happen, they should be preparing for *when* they happen."

It's not only foreigners whinging. The day after the Kobe quake struck, Jin Nakamura, business editor of *The Yomiuri Shimbun*, wrote in an editorial exploring a potential Tokyo quake: "In the midst of such circumstances, we suffer from weak leadership with no clear leadership, bureaucrats who reject reform, and a business community struggling to overcome economic stagnation. All appear reluctant to deal with the problem. Except for indulging in wishful thinking that Tokyo will somehow be spared."

But odds are Tokyo won't be spared.

The question is: Will we? ■

SOUTHERN CALIFORNIA'S FUTURE WILL BE BURDENED BY AN APOCALYPTIC 'ECOLOGY OF FEAR' ACCORDING TO URBAN-THEORIST MIKE DAVIS. DAVIS EXCAVATES THE FUTURE OF THE 'CITY OF QUARTZ.'

FUTURE NOIR

The ultimate world-historical significance of Los Angeles is that it has come to play the double role [illegible] and dystopia for advanced c[illegible]ism.

by Mark Dery

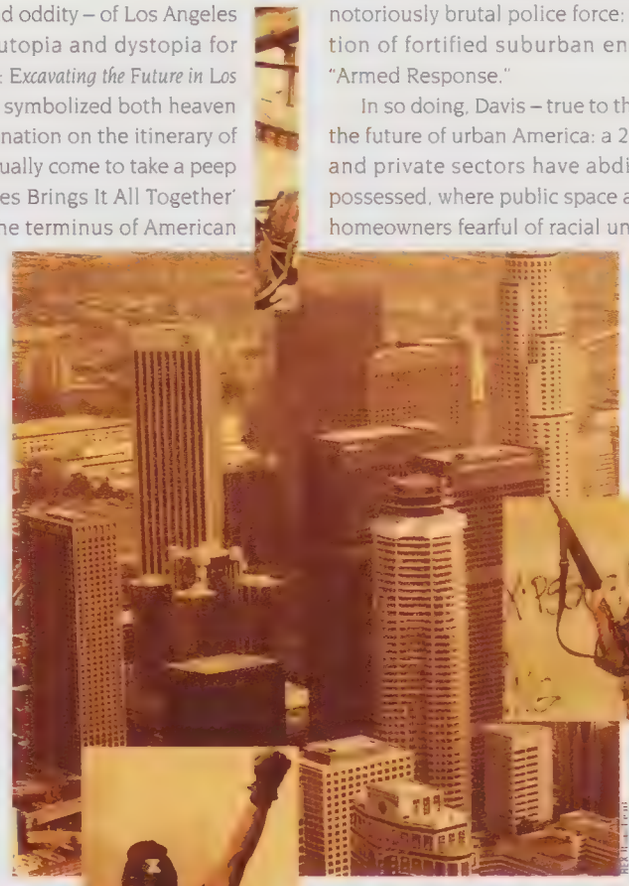
Photograph by Chris van Menge

TO Mike Davis, the burnished urban surface of what postmodern intellectuals are fond of calling L.A.'s "depthless present" is a rear-view mirror. In it, Davis sees the historical transformation of Los Angeles, into the sun-kissed Promised Land of popular myth, by real estate barons and other influential boosters with vested interests. By contrast, he also sees the invocation of the city's nightmare double in the anti-myths of *noir* writers such as James M. Cain (*Double Indemnity*), essayists such as Joan Didion (*Slouching Toward Bethlehem*), and "post-*noir*" novelists such as James Ellroy (the Los Angeles Quartet).

"The ultimate world-historical significance – and oddity – of Los Angeles is that it has come to play the double role of utopia and dystopia for advanced capitalism," writes Davis, in *City of Quartz: Excavating the Future in Los Angeles*. "The same place, as Bertolt Brecht noted, symbolized both heaven and hell. Correspondingly, it is the essential destination on the itinerary of any late-20th-century intellectual, who must eventually come to take a peep and render some opinion on whether 'Los Angeles Brings It All Together' (official slogan), or is, rather, the nightmare at the terminus of American history (as depicted in *noir*)."

At the same time, Davis uses the city that Umberto Eco (*Travels in Hyperreality*), Jean Baudrillard (*Simulations*), and other tourist-theorists see only as a shimmering mirage of simulation, as a crystal ball – a "city of quartz" in which he discerns glowering clouds on the horizon of our collective future. In *City of Quartz*, he makes short work of knee-jerk postmodern critiques that collapse all of L.A. into Hollywood, Disneyland and the Bonaventure Hotel, "reading" the city as "nothing more than an immense script and a perpetual motion picture" (Baudrillard) – the apotheosis of fakery, narcissism, hedonism and clawing desire. Just as neatly, he skewers critiques that envision L.A. as a designer dystopia in the darkly romantic, *Blade Runner* mold, arguing that they convert "history into teleology and glamorize the very reality they would deconstruct." Both analyses float free of social reality and historical causality, argues Davis.

A 49-year-old native Californian and unrepentant Marxist who teaches urban theory at the Southern California Institute of Architecture, Davis drills through the sedimented myths of what the architectural critic Michael Sorkin has called "the most mediated town in America," returning us to the cold, hard bedrock of historical fact with a jarring thump. "If there is any cliché I wanted to undo," he told a *Los Angeles Times* writer, it was the one about "the insubstantiality of Los Angeles." An all too rare hybrid of activist intellectual, impeccable historian, and gifted storyteller, with a blisteringly caustic wit, Davis is above all a very angry man with a rage to understand: every word of *City of Quartz* reads as if it were etched in an acid bath. William Gibson, who cites its influence in the acknowledgements to his novel, *Virtual Light*, pronounced it "more cyberpunk than any work of fiction could ever be." Forget Baudrillard and the rest of the effete, elite, professoriate riding on his coat tails; mesmerized by the vapor trails of pure theory, they turn a blind eye to the ever-grimmer human reality behind the hyperreality. For them, as Davis notes, "What was once anguish seems to have become fun."



Live, from ground zero, *City of Quartz* and Davis' two brief dispatches from the frontlines – *Beyond Blade Runner: Urban Control/The Ecology of Fear* and *L.A. Was Just the Beginning/Urban Revolt in the United States: A Thousand Points of Light* (both published by the Open Magazine pamphlet series) – begin to theorize a way out of this place. Delving into the past, he unearths the market forces and social engineering that have made Los Angeles what it is: a megalopolitan sprawl straight out of Gibson's *Virtual Light* – economically and ecologically moribund, ravaged by social polarization and racial tensions that have provided fertile ground for the criminalizing of non-whites, urban youth and the homeless; the militarizing of a notoriously brutal police force; the privatizing of public space; and the proliferation of fortified suburban enclaves whose lawns bristle with warnings of "Armed Response."

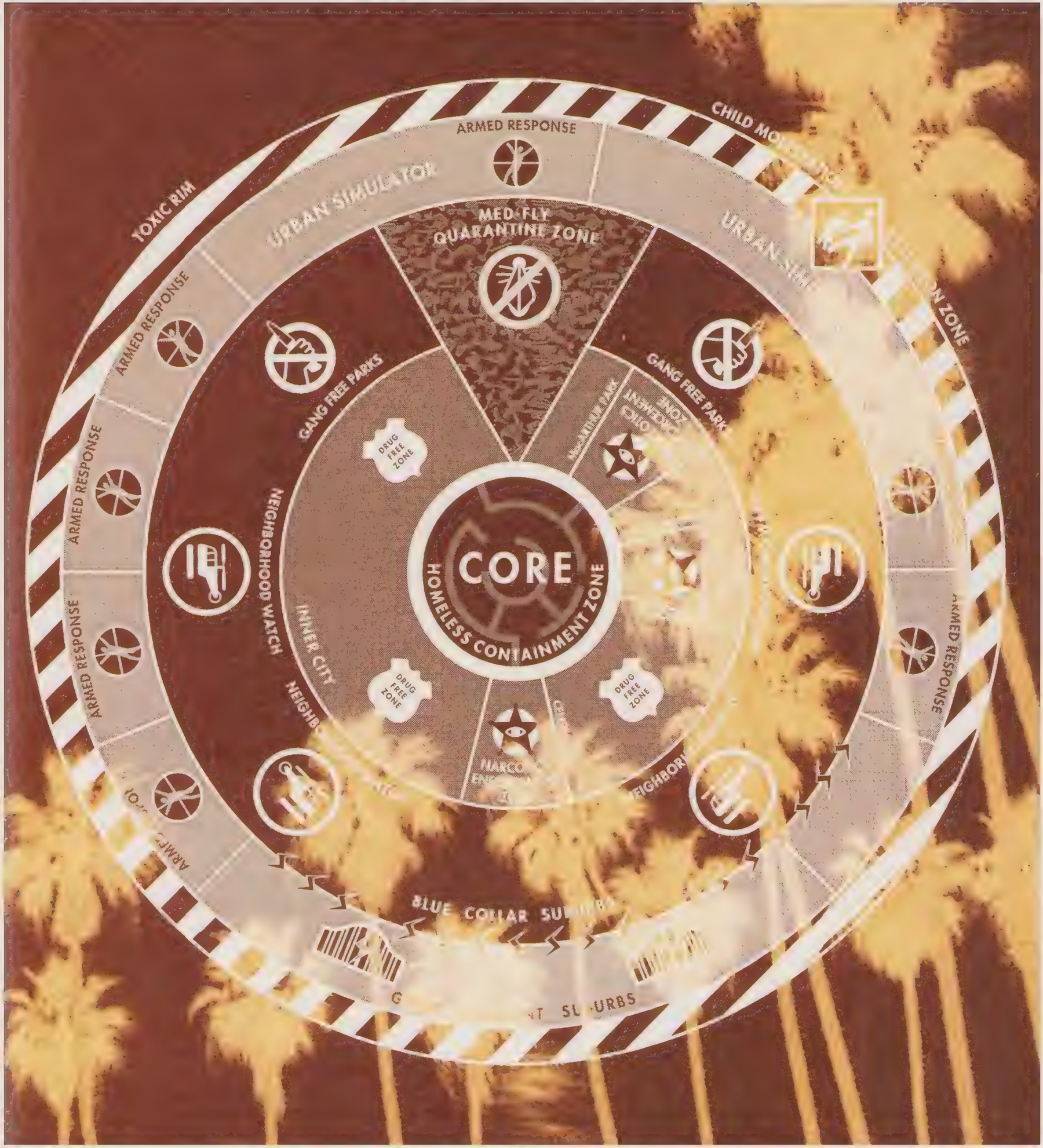
In so doing, Davis – true to the book's title – excavates a worst-case scenario for the future of urban America: a 21st-century Los Angeles in which the government and private sectors have abdicated any vestige of responsibility to the dispossessed, where public space and civil rights have been willingly relinquished by homeowners fearful of racial unrest and gang violence; and where the upper-and middle-class citizenry has incarcerated itself in gated communities or, on family outings, in surveilled, privately patrolled malls, "historic districts," or theme parks. Already, as Davis notes in *Beyond Blade Runner* Universal Studios has constructed a "parallel urban reality" called CityWalk, repackaging "the best features of Olvera Street, Hollywood and the West Side" in what its designer calls "'easy, bite-sized pieces' for consumption by tourists and residents who 'don't need the excitement of dodging bullets... in the Third World country' that Los Angeles has become."

On *Beyond Blade Runner*'s final page, he asks, "Will the ecology of fear become the natural order of the 21st-century American city?" The forecast, to Davis, is not auspicious. "If we continue to allow our central cities to degenerate into criminalized Third Worlds," he writes, "all the ingenious security technology, present and future, will not safeguard the anxious middle class. The sound of that first car bomb on Rodeo Drive or in front of City Hall will wake us from our mere bad dream and confront us with our real nightmare."

Within the toxic rim: The cityscape of the City of Angels hides the racial and cultural tensions of the street. **Above right:** the Californian National Guard stands watch during a lull in the battle. **Below:** a protester during the LA riots raises his fist in defiance.

The Great Divides: Mike Davis' city of the future is illustrated in *The Ecology of Fear* as a series of contained zones. At the core is the homeless and the poor, ringed by heavily armed law enforcement groups. From there, the concentric rings become more affluent, however hemmed in by the toxic rim that the city has created for itself. Davis' diagram is redesigned by 21•C and illustrated by Greg O'Connor.

Photograph and illustration by Greg O'Connor


CORE
HOMELESS CONTAINMENT ZONE
MED-FLY QUARANTINE ZONE
DRUG FREE ZONE
DRUG FREE ZONE
DRUG FREE ZONE
GANG FREE PARKS
GANG FREE PARKS
NEIGHBORHOOD WATCH
INNER CITY
ARMED RESPONSE
ARMED RESPONSE
ARMED RESPONSE
ARMED RESPONSE
ARMED RESPONSE
ARMED RESPONSE
URBAN SIMULATOR
URBAN SIMULATOR
TOXIC RIM
CHILD MO
ZONE
BLUE COLLAR SU
SUBURBS

In *City of Quartz*, you offer a stinging critique of the cynical, apolitical ecstacies of postmodernism, quoting an *L.A. Weekly* writer who notes that Baudrillard "loves to observe the liquidation of culture, to experience the delivery from depth." At the same time, your Orwellian descriptions of the LAPD's aerospatiale helicopters and the city's gated communities were seductive enough to influence William Gibson's *Virtual Light*. Do you ever feel as if you're in danger of succumbing to the same sublime horror that Baudrillard seems to relish?

Davis: Well, it's difficult to resist the spectacle. Part of the aftermath of the '92 rebellion is that everybody has his riot experience; thanks to the looting of Sammy's Cameras on Fairfax and Beverly, virtually everybody in the mid-city now considers himself to be a battle-hardened survivor of an urban riot. It's generated this great melodrama and a sense of danger which is, of course, totally disassociated from the daily acid drip of poverty, cutbacks and the incredible monotony of daily life in the city for the majority of its inhabitants.

I don't really know what postmodernism is; I do know that we live in a post-liberal, post-reformist period where substantive urban reform has been abandoned and where the liberal positions of the '60s now stand in almost revolutionary relatioship to political discourse in this country. What's being recycled as postmodernism is Frankfurt School Marxism in its most pessimistic mode, although admittedly jazzed up with some very interesting thoughts about new technologies and media. But Marcuse's One-Dimensional Man still squats on the horizon, shaping the argument; the "postmodern" disappearance of the critical subjectivity is pure Marcuse.

So is this really a stage beyond modernism or are we witnessing the decadent droning on and on of a modernism that no longer bears any trace of reform or hope? I mean, as the governor's insisted time and again, with admirable, horrifying clarity, the Californian budget debates of the past few years are a debate about the future, in which the public sectors are permanently downsized and as a result the future is downsized for a whole generation of children and immigrants and people of color.

The irony is that the corporations who support the governor are destroying the whole institutional matrix that made California the leading science-based economy in the world. In their immediate impact on the inner cities of Southern California, the budget cuts do far more damage than the riots. You're talking about a billion dollars immediately taken out of public programs and the loss of about 15,000 jobs in the black community, which is just disastrous At the moment, when needs are increasing, the major cities in the United States are downsizing not just their short-range commitments but their long-term ones. Of course, we can go farther: Detroit and Michigan have shown that you can even abolish general relief, leaving people without any safety net whatsoever.

Thomas Hine, in his book *Facing Tomorrow: What the Future Has Been, What the Future Can Be*, suggests that we have ceded the territory of the future, and that our inability to conceive of it except in caricatured, cynical terms is a sign of cultural rigor mortis. Do you think we've arrived at that pass?

No, and I suppose I'm hoist on my own petard here because I've profited greatly from peddling apocalyptic visions to people. But there's two kinds of realities struggling in the heart of this city. On one hand, you have levels of inhumanity that are being naturalized and accepted every day that return us to the worst part of the 19th century. At the same time, you can still find some of the greatest working-class neighborhoods in the United States in Los Angeles. Sundays in the park are as funky and as much fun as ever, and people haven't lost the vision or understanding of what the good life is. One of the things I've increasingly ended up fighting for, where I teach and in the kind of politics I do, is a nostalgized vision of what Southern California was like 30 years ago – the freedom of its beaches and its cruising streets and the kind of careless, libidinal adolescence that used to be possible Looking back, I see the enormous advantages that were conferred on childhood and adolescence by the levels both of social expenditures that existed in this state in the '50s and '60s and by the relative freedoms, the intoxications, that white kids had Without making that a golden age (because it wasn't, for kids of color), it's certainly something to defend in the present dark ages of the city where the only legal activity for city kids now is to consume. The Santa Monica city council had this big debate about putting a curfew on their wonderful new Third Street promenade and they decided that the only lawful activity for youth after dark is to shop.

At the same time, it's a commonplace that the mall paradigm has infested urban design at large.

Of course, although I should point out that the malling of public space doesn't have this kind of Marcus-ian determinacy, where the critical consciousness or the rebellious subject is extinguished in the sweet plunder of intoxicated consumption. Rather, what actually happens is the definition of new forms of criminality, to the extent that the social spaces that people – particularly kids – use are now these pseudo-public spaces, malls and their equivalents. Increasingly, the only legal youthful activities involve consumption, which just forces whole areas of normal teenage behavior off into the margins. I recently read an account in the *Orange County Register* of how Irvine, which is the last generation's absolute model utopia of a master-planned community, is producing youth pathologies equivalent to those in the ghettos simply because in the planning of Irvine there was no allotted space for the social relationships of teenagers, nowhere for them lawfully to be – the parks are closed at night, they're not allowed to cruise, and so on. So you get these seemingly random, irrational acts of violence

A far cry from the misty Wagnerian romanticism of *Blade Runner's noir* metropolis.

Which underscores the limits of the *Blade Runner* vision. What we need right now is the rigor of a hard, relentlessly realistic future. William Gibson provides us with the best template of the dark future we're building, by extrapolating what actually exists, whereas *Blade Runner* is just a gothic romance. There's nothing in it that shows you how L.A. will erode into the 21st century

because most of this city – its interior valleys – are flat, anonymous plains of dingbats and bungalows and ranch-style homes retrofitted with increasingly ghastly medium-density stuff. *Blade Runner* is a pastiche, and when you peel away some of the layers, its core vision is *Metropolis*, which in turn is Hugh Ferris – this continuing obsession with modernism, where the future city is a kind of monster New York. You could probably go all the way back to a book H.G. Wells wrote in 1906 called *The Future in America*, in which he talks about a methodology for envisioning the end of the 20th century through a process of gigantism. That's what's continuously underlaid that vision – the mile-high skyscrapers, the little squad cars flying around in the air – and *Blade Runner*'s fidelity to this Wellsian vision of the future certainly contrasts with Gibson's.

***Blade Runner*, in the final analysis, is about retro-futurism – a nostalgia for obsolete tomorrows.**

Yeah, and another thing that has to be fitted into this – and I'm not sure how it works, exactly – is this whole cult of dead tech, this cargo cult of de-industrialization that, at least in contemporary L.A., is enormously in vogue on the West Side. By this I mean that people whose daily work has almost nothing to do anymore with the worldly production of goods seem to desire huge gears and obsolete machinery. The flotsam and jetsam of the old industrial age is an ambience everywhere; most of the restaurants and bookstores and micro-breweries on the West Side have some kind of decor that has to do with industrialization – a kind of Second Machine Age. It's precisely because we've come to the point of de-industrialization that all of this stuff has become perfumed ruins; it has the same relationship to contemporary consciousness that the medieval landscapes had for the Romantics.

Isn't this an example of what McLuhan meant when he said, in *The Medium is the Massage*, that "We look at the present through a rear-view mirror?"

Yeah, I think so, but around it is some strange process of nostalgia which I can't quite figure out, and of course it's surrounded by the aura that there's no hope of ever doing any of this stuff again and a kind of world-view that I think forgets that much of the subsistence of the world is still produced in this fashion, just not here.

One of the things I find interesting in contemporary architecture here is a kind of techno-Baroque, an excessive amount of what's really just decorative quoting of industrial motifs. I don't think that the computer chip has produced its own aesthetic, a contemporary version of streamlined Deco. It's hard to find an analog between the revolutionary new technologies and the design of the city itself. At the same time, if you look at the work of artists like Robert Irwin, who sculpts space in an almost Zen way, using things like light and reflection and refraction, you get some sense of the possibility of an austere aesthetic of the microchip and the creation of new kinds of ephemeral spaces. It always delights me to drive through Dallas at night because of the way that the skyscrapers are programmed to play light shows with each other.

It sounds like an architectural metaphor for the blinking lights on Daniel Hillis' massively parallel Connection Machine or the light-streaked datascapes of Gibson's Matrix.

It has something to do with a microelectronic aesthetic of very transient and decaying states, and applies primarily to the city at night – the city playing strange light games with itself, evoking dreams and floating images, producing an infinity of mirages. The one model we have is *The Empire of Signs*, Barthes' interpretation of Japan, and of course the advertisements in *Blade Runner* that float like clouds through the cityscape. There's a lot there to play with, but I don't know anybody who's actively working with it.

Are we witnessing the decadent droning on an en of a modernism that no longer bears any trace of reform or hope?

The malling of public space, which we were talking about, is attended, increasingly, by the theme-parking of reality. On that note, what do you make of CityWalk, Universal Studios' loving recreation of an L.A. that never was?

CityWalk is the moment when Baudrillard draws a huge, satisfied breath and draws deeply on his cigar; it's the simulacrum of the simulacrum. Of course, CityWalk has more to do with the competitive challenge of Florida than anything else. If you want to enjoy Hollywood now, you go to Florida, so Universal Studios is responding to that by making it possible to go to Hollywood right here in L.A.! You know, this idea of taking the traditional public tourist spaces and interiorizing them in theme parks and security environments – putting them in aspic, so to speak – is what Disneyland is doing with its expansion. They're going to have a version of San Diego's Victorian Hotel Del Coronado and so on; the idea is to be able to do the whole grand tour of Southern California without ever having to leave the safe perimeters of the theme park. In time, there will be very little left outside the theme parks.

Speaking of which, Disneyland is conspicuously absent from *City of Quartz*.

It wasn't something that I was particularly interested in, though if I were to do Disneyland, I wouldn't be concerned so much with the politics of spectacle as with straightforward questions of exploitation and the living conditions of the people who make the machinery of Oz work. There are much stranger realities than Disneyland in Southern California. The old industrial belt along the L.A. river has become this vast zone that consists of recycling and salvage yards. I met these immigrant workers there who break up computers all day long in a computer junkyard, in my mind typifying postmodern proletarians. You have to imagine a pile about 30 feet high of literally thousands of broken, defunct computers, and these guys with ball-pen hammers and screwdrivers and pliers listening to rock'n'roll in Spanish, dismantling this stuff. There was one really funny guy who, when I asked him why he'd come to California, said, 'To work in your hi-tech economy,' as he smashed an obsolete Macintosh.


deus ex

THE AUTHOR OF **'WAR IN THE AGE OF INTELLIGENT MACHINES'** MEETS THE LEADER OF **SURVIVAL RESEARCH LABORATORIES** TO DISCUSS THE POLITICS OF TECHNOLOGY, THE INCIPIENT SELF-AWARENESS OF PREDATORY MACHINES, AND THE DARWINIAN NATURE OF MILITARY EVOLUTION.

by Mark Dery

machina

"In the machine performances of Survival Research Laboratories, the non-rational and the absurd act as the baseline of all activity," declares Mark Pauline, in his essay "Technology and the Irrational."

Survival Research Laboratories, which Pauline founded in 1979, is a San Francisco-based band of rogue technologists that stages mechanical spectacles in which remote-controlled weaponry and autonomous robots menace each other – and audience members – in a murk of fumes and flames. Bearing hyperbolic titles that sound like a cross between a carny barker's spiel and a top secret psywar report – *Extremely Cruel Practices: A Series of Events Designed to Instruct Those Interested in Policies That Correct or Punish; A Carnival of Misplaced Devotion: Calculated to Arouse Resentment For the Principles of Order* – SRL performances incorporate industrial machinery and military technology (an electromagnetic rail gun, a V-1 jet engine) in a Theater of Operations that explodes popular myths about telegenic antiseptic, "smart" wars.

But they're more than war games. Defiantly self-contradictory, the events staged by Pauline and his collaborators confound neat critiques and resist moral closure. Polyvalent and perverse, they evoke monster truck rallies, pagan rituals such as the burning of the wicker man, and Jean Tinguely's auto-destructive kinetic sculpture, *Homage to New York*. They incarnate Baudrillard and Virilio's overwrought soliloquies about speed and the implosion of meaning in post-modern technoculture even as they invite comparison with blue-collar rituals such as the demolition derby or the sci-fi Circus Maximus in *Death Race 2000*. Hurtling headlong into each other like bumper cars, or consecrated to oily conflagrations, the group's suicidal machines can be read as a mordant critique of the permanent war economy and the lunatic excesses of Mutual Assured Destruction. SRL spectacles celebrate technocracy's malfunctionings even as they concretize cyberpunk fantasies of mutinous machines and technologically-enabled resistance.

In the final analysis, however, the group's Circus Machinus does not so much critique late-20th-century technoculture as crystallize it. SRL's colliding vehicles, reanimated roadkill, and amok weaponry offer a scaled-down model of our chaos culture, with its freeway pile-ups, automated slaughterhouses, and random acts of senseless violence.

Chaos is Manuel De Landa's bailiwick as well. In *War in the Age of Intelligent Machines*, he considers the evolution of machine intelligence from a vantage point at the intersection of chaos theory (Ilya Prigogine and Isabelle Stengers' *Order Out of Chaos* are key sources) and the post-structuralist historiography of Foucault, Virilio, and especially Deleuze and Guattari (*A Thousand Plateaus*). If this sounds dry, it isn't: *War in the Age* reads like a Prigoginic Origin of the Machine Species, as written by the Terminator on DMT; a souvenir guidebook from a Gulf War theme park, as narrated by an Audio-Animatronic Foucault; the internal monologue of a smart bomb seconds from impact, as imagined by Deleuze and Guattari

De Landa's argument turns on the notion that what chaos scientists call singularities – the "transition points... where order spontaneously emerges out of chaos" – catalyze curiously life-like behavior in non-living matter: so-called "chemical clocks," in which billions of molecules oscillate in synchrony, or amoeba colonies, in which cells "cooperate" to form an organism. Alternately, singularities

can be seen as generating machine-like phenomena in nature: "The tectonic forces behind the burial and folding of sediment are driven by molten rock flowing up from beneath the [Earth's] crust in convection cells," says De Landa, in his essay "Nonorganic Life" in *Zone 6: Incorporations*. "A coherent flow arising after a temperature bifurcation, constituting a kind of self-assembled conveyor belt. The rivers that sort out the pebbles and grains that make up the layers of sediment can be seen as self-organized 'hydraulic computers.'" Taken together, the singularities that give rise to such phenomena comprise what De Landa, following Deleuze, calls the machinic phylum, which he defines as "the overall set of self-organizing processes in the universe... all processes in which a group of previously disconnected elements suddenly reaches a critical point at which they begin to 'cooperate' to form a higher-level entity." Citing the "cooperation" of individual spinning atoms to make metal magnetic, or the "cooperation" of a termite colony to build a nest, De Landa notes that chaos theory suggests that "the onset of these processes may be described by essentially the same mathematical model. It is as if the principles that guide the self-assembly of these 'machines' (e.g., chemical clocks, multicellular organisms, or nest-building insect colonies) are at some deep level essentially the same."

The machinic phylum "blurs the distinction between organic and non-organic life," contends De Landa, rendering interchangeable the materialist and vitalist metaphors that have traditionally structured our knowledge of the natural world. In the endnotes to *War in the Age*, he notes that the turbulent, interactive systems of the Earth's atmosphere, biosphere, and geological processes can be understood as "aspects of the same 'mechanosphere.'" In conversation, he turns the trope inside out, observing that the machinic phylum contains such "creatures" as those "that inhabit the hydrosphere, like hurricanes, cyclones, tidal waves, and so on, as well as creatures that inhabit the lithosphere, like lava flows, which are like gigantic conveyor belts moving the continent."

Going further, De Landa argues that the evolution of technology might be seen as a self-organizing process in which human agents function as "industrious insects pollinating an independent species of machine-flower that simply [does] not possess its own reproductive organs." (This wry notion has a distinguished lineage: Samuel Butler offered cautionary words in *Erewhon* about our role in the genesis of "machines which reproduce machinery", and Marshall McLuhan observed in *Understanding Media* that humanity serves as "the sex organs of the machine world, enabling it to fecundate and to evolve ever new forms.") According to De Landa, it is the evolution of the war machine – the development of engines of destruction as well as the emergence of military institutions and their machine-like organizational paradigms – that has fostered the emergence of machine intelligence. From ancient metallurgists to contemporary software engineers, technicians – most of whom historically have been employed by the war machine – can be seen as unwittingly "tapping into the resources of self-organizing processes in order to create particular lineages of technology."

Employing the sci-fi conceit of a robot historian delving into the origins of his species, De Landa writes, "Just as we see the animal kingdom as the place where evolution 'experimented' to create our own sensory and locomotive machinery, so [a] robot historian would see processes in which order emerges out of chaos as its own true ancestors, with human artisans playing the role of historically necessary 'channelers' for the machinic phylum's 'creativity.'" Thus, gunsmiths who "tracked the machinic phylum," using their intuitive grasp of the singularities governing the melting points of metals and the spin rates of projectiles to invent new weapons, would appear as selective evolutionary pressures to a robot genealogist.

Tracing the intertangled genealogies of the war machine, the computer, artificial intelligence, artificial life, and chaos theory, *War in the Age* ends on the threshold of a phase transition in machine evolution. In the *Terminator* 2 version of the alternate futures foreshadowed by De Landa, prototype "killer robots" such as the unmanned armed vehicle PROWLER have begotten a race of nomadic, predatory machines that have rendered the human soldier obsolete. Intelligent and implacable, hunter-killer machines would inevitably look beyond the battlefield, casting a speculative eye on humanity's niche on the evolutionary ladder. More auspiciously (but less convincingly), De Landa imagines humanity's use of the machinic phylum to facilitate "a symbiosis in which the evolutionary paths of humans and machines interact for their mutual benefit." He catches glimpses of this symbiosis in the computer screen – "the place where the machinic phylum joins humans and machines into a higher-level, synergistic whole." De Landa makes explicit the politics that creeps into the pronouncements of A.I. and A.L. theorists such as Rodney Brooks and Chris Langton, whose talk of computer programming that is "bottom-up" rather than "top-down," decentralized rather than centralized, closely parallels Gingrichian rhetoric of deregulation, decentralization, demassification, devolution, and desynchronization. At best, De Landa's politics amount to the currently fashionable fuzzy logic about information-wants-to-be-free and centralization-is-bad – Third Wave articles of faith whose hazy generality makes for easy appropriation by cyber-conservatives. Cyber-cons have mapped these ideas onto decidedly Second Wave sermons about the virtues of radical deregulation and privatization over a micromanaged, command-and-control government. In the Tofflerian cyberbole of Newt Gingrich, *Wired* interviews with *laissez-faire* futurists such as George Gilder and Peter Drucker, and Kevin Kelly's *Out of Control* (whose jacket copy promises "a new set of 'fast, cheap, and out-of-control' business strategies for an emerging global economy built on networks"), corporate dreams of a transnational capitalism unfettered by governmental regulation or social responsibility are repackaged in the sexy rhetoric of chaos theory and artificial intelligence.

But translated from computer science into economic and political terms, Prigoginic visions of decentralization and self-organization amount to a massively parallel Reaganomics. As Ellen Willis recently noted in *The Village Voice*, "the escalation of 'decentralization' and 'demassification' is occurring at a time when we are witnessing the most effective centralization of economic power the world has ever known. The current Republican lust to dismantle the federal government is not about shifting power to citizens but about attacking the only institution that's still capable, to some extent, of resisting or bargaining with the interests of international capital."

The murkiness of De Landa's politics is exacerbated by *War in the Age*'s fractal structure. Maddeningly repetitive, dizzyingly digressive, the book's organization mimics the patterns of turbulence that fascinate its author, with their "eddies and vortices nested inside more eddies and vortices."

Then again, corkscrew structure is to be expected from a nomadic autodidact like De Landa. In addition to a common interest in predatory technology, both he and Pauline are confirmed *ad hoc*-ists. A self-taught machinist, Pauline is a techno-*bricoleur* who builds his devices from scavenged detritus. He has assembled a brain trust of Silicon Valley deserters – engineers, physicists, and computer scientists seduced by the prospect of turning their skills to unconventional ends. The Mexico City-born De Landa, an avant-garde filmmaker who makes a living creating 3-D computer animation for commercials and corporate presentations, is an academy hacker who arranges concepts gleaned from eclectic reading in post-structuralist theory, science, and history, not to mention visionary experiences on psychedelic drugs, into polymathic mosaics.

Although Pauline had read *War in the Age* and De Landa had seen SRL videotapes, the two had never met. When we learned that Pauline would be visiting New York, the solution seemed obvious: a trialogue in De Landa's midtown apartment. It was a conversation full of singularities.

Mark Dery: **The notion of the "machinic phylum" is central to *War in the Age of Intelligent Machines*. Could you expand on that definition?**

MDL **[Manuel De Landa]:** If you read *Molecular Revolution* by Guattari, it's all there. The idea, basically, is that humans don't really invent machines. A hurricane is a motor in the literal sense, a motor being defined as something with a heat reservoir that circulates heat through a Carnot cycle via differences of temperature. When a hurricane is born, a lot of self-organizing processes are involved – coherent fluxes of eddies, for instance – that bring heat from the outside and concentrate it into a reservoir. In other words, it's a self-assembled motor. That, to me, is a mind-blowing concept, because it took centuries before humans discovered the motor, something that self-assembles spontaneously in nature.

So the machinic phylum is simply the notion that as soon as you let matter and energy in any form (whether it is organic or inorganic) flow in a non-linear manner (that is, past a certain threshold of complexity) machines will tend to spontaneously self-assemble. The key word here is non-linear

Singularities bootstrap the system up to another level of development.

MDL Exactly, although "attractor" and "bifurcation" are clearer terms than "singularity." When you let matter and energy get far from equilibrium, spontaneously-stabilized states called "attractors" emerge, and once they become coherent, they interact with one another to produce a "bifurcation" – a critical transition where new attractors can emerge. This is the way in which evolution climbs up, from one attractor to the next. To put it another way, interactions settle into stable states, or attractors, and then they go through a bifurcation, producing a new set of stable states. Thus, you have a world which is basically a set of attractor-stabilized interactions.

Mark, your performances could be seen as dynamical systems. Have you noticed any consistent patterns in the flux and flow of machine interaction?

MP **[Mark Pauline]:** Yeah, it's all based on being able to pump enough energy, enough machines, enough inputs of all kinds into the situation. Otherwise, you get a collection of machines stomping around, half way between a performance and chaos. To me, a show is when everything coalesces in such a way that it's undeniably more than the sum of all the activities involved.

Which sounds like a system that has settled into one of De Landa's attractors.

MP Yeah, it's the idea that more is more, that you only have evolution if you feed enough elements into the system.

MDL What Mark does is push things far from equilibrium, to that point of unpredictability. From the videos I've seen of his performances, I gather that a lot of the experience has to do with the fact that you don't know when these machines are going to attack the audience; there's no fourth wall protecting you, and the question in everybody's mind is, "Hey, are these guys really in control?"

"The ethics here is an ethics not of good and evil but of the homogeneous versus the heterogeneous, linear predictability versus experimentation, combining flesh and metal to see what happens."

SRL Performance

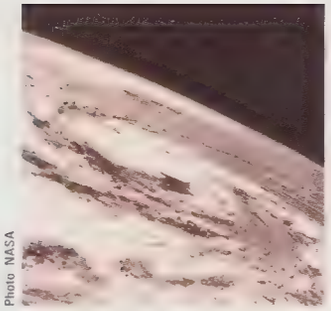


Photo NASA

In "War in the Age," De Landa notes that the turbulent, interactive systems of the Earth's atmosphere, biosphere, and geological processes can be understood as "aspects of the same 'mechanosphere.'"

MP But that, to me, is the mark of a true machine consciousness – when a mechanical system gets to a point where there's a disjunction between you and what's going on, because what's going on is just too complicated or too intense. Systems are getting so complicated that they're out of control in a rational sense. The role model for the future of human interaction with machines, if we want to avoid our own destruction and regain control, is to start thinking of our interaction with technology in terms of the intuitive, the irrational.

MDL The best way of seeing this is by tracing the history of artificial intelligence. A.I. starts with the very Cartesian notion that rationality is just a set of infallible recipes or algorithms which, once figured out and put inside a machine, will yield rationality. But that's not the way it is, so now we have neural nets, which are not rational, although the emergent behavior of a net seems to be rational. The net computes, but it's doing it "intuitively," in a sense, by settling into dynamic states.

Do you employ neural nets in any of your systems, Mark?

MP The swarmers, a crude artificial life-type platform running a very basic program, are arranged so that all the different processors in their software are interconnected. We have four of them, which is the bare minimum we need to get them to exhibit some sort of emergent behavior. Each one has an emitter-detector head and their program tells them to go closer to whichever machine is closest to them. So they go towards the other, but as soon as they get close, they try to go the other way. And as they're all doing this at the same time, they start to produce this weird behavior where they clump together, swarming around. The software worked very well in France, where we did a very fine and disgusting performance with the swarmers. They're about the size of a person, and we put a rotting cow's head on one end of each swarmer and inevitably people would get these things stuck between their legs. There was vomit all over these machines after the show; it was really strange. I don't think Rodney Brooks would be interested in this kind of, uh, application.

MDL We live in a deodorized society that tries to eliminate intensity as much as possible; one of the things I admire about Mark's work is that he uses the human body as a laboratory. I think this connects to what I call "destratifying" the body. One way of destratifying the body is through telepresence. Mark's remote-controlled devices affect the mind of the operator so that he or she becomes the machine, an experience that is all about intensities: the moment mental concentration reaches a certain critical point, then a new state is reached.

MP I was just running our high-pressure ai -launcher for about an hour last week. We don't have a Polhemus sensor to track the head motion because of the magnetic fields; instead, we have a very lightweight armature that you put on your shoulders – it weighs maybe a pound and a half – and there's a little visor that clamps on your head, with two high-eight camera viewfinders that fit into your eyes with eyecups. There's a set of servos that turns your head into a big joystick operation, so that when you move

The role model for the future of human interaction with machines, if we want to avoid our own destruction and regain control, is to start thinking of interaction in terms of the intuitive, the irrational.

Photo: Steve Fugikawa

your head the machine points wherever you look. You can't whip your head around and get the machine to follow you immediately, but then even the Hughes helicopter gun control systems don't do that. On the machine is an air-launcher that uses high pressure CO_2 to fire a beer can filled with concrete, about 80 grams of high explosive, and a contact detonator at about 550 feet per second. So that's the set-up: you've got 20 rounds in there and you've got a little ergonomic controller that allows you to push these buttons that you feel with the sweep of your thumb, locking the gun down once you've acquired the target. There's a crosshair at your focal point about four feet away and when you line up the target with that, you fire, and it just obliterates it.

MDL Do you get the feeling that you're becoming the machine when you operate this thing?

MP Oh, yeah. The depth perception is incredible, and once you get all the little adjustments right, you just sink into it. You start to imagine your body in different ways just like you do when you're in an isolation tank; it becomes transparent, really, because of the comfort level, which is the key feature in any of these input devices. Once you achieve transparency, interesting things start to occur. It doesn't take much, because the mind is looking for these things, actively trying to meld with anything. So there's all kinds of things going on that can't be described in any kind of qualitative terms but something's going on – something strange.

It seems as if there's an ontological nausea, beyond simulator sickness, induced by the experience of losing your body. People mapping cyberspace are obsessed with creating new, cartoon bodies or inventing tactile effectors to generate the sensation of touch on the actual, physical body.

MDL Well, we have all these self-organizing effects, clocks that regulate the sleep cycle and so on, trapped in our bodies – trapped in the sense that DNA controls when they manifest themselves. DNA is this stratifying force, making us into a species. Any experience that opens up a little bit of space that DNA doesn't control directly, allowing these self-organizing processes to play more freely, is to me an important thing to experiment with.

I'd like to go through another bifurcation, if I may, into the realm of the political. I found *War in the Age's* politics – or lack thereof – problematic. By theorizing your subject – which is, after all, the evolution of the military organism and kill technology – in the clinical language of chaos science, artificial life, and post-structuralism, you abstract it to the degree that the reader forgets that war is also a story about the assembly line genocide of the Holocaust or the rape of Bosnian women.

For me, the book is haunted by the absence of such atrocities, and I can't help wondering to what extent your use of paradigms drawn from the hard sciences is complicit in deodorizing the horrors of war. In refracting the history of modern warfare through chaos theory, you make frequent use of metaphors taken from nature – chemical clocks, nest-building termites, and so forth – that serve to naturalize mass slaughter, positioning it almost as an elemental force. In *Mythologies*, Barthes warns us that one of ideology's most insidious aspects is that it converts constructed social reality, and the power relations embedded in it, into innocent, immutable "nature." By relocating the evolution of the war machine outside culture, in nature, don't you absolve human actors, from the architects of the Holocaust to Serbian rapists, of ethical responsibility?

MDL That's a good question. In *War in the Age*, my politics can be boiled down to centralization versus decentralization. The former doesn't work; the latter does. Of course, it can work for whatever purpose you want – destruction or construction. A centralized war machine is not going to work, not even for its purpose of raping the Earth's resources for its own fuel, whereas a decentralized one will. I structured the book this way because I wanted my readers to feel that I had my feet on the ground. I started by saying, "Even in the military, the most hideous of institutions as far as we're concerned, are decentralization functions." At the same time, I wanted to say that this was not something that the military did by itself; it was forced to decentralize. The ARPANet is a decentralized network not because the military wanted to decentralize it, but because the only kind of network that can survive a nuclear attack and reconfigure itself is a decentralized one. So my theme is centralization versus decentralization; that's my basic politics. But I didn't want to say that in an overly optimistic way – 'Hey, let's decentralize!' I wanted to put it in harsh terms so that people would know that I'm perfectly aware that we're surrounded by power mechanisms, empire-building institutions. But even in these terrible structures, you can still see the same processes.

But it's precisely because you suspend all ethical judgment for the bulk of the book, analogizing the swarming of individual bodies engaged in mutual destruction to turbulent eddies in clouds or water, that the reader has the impression that the only thing wrong with the war machine is that its administrative and bureaucratic structures are hopelessly inefficient. "Good," in *War in the Age*, is posited as that which makes the most effective use of its resources, by which logic one could argue that there was nothing inherently evil about the death factories of the Third Reich, that the only thing "wrong" with them was that they exterminated what could have been an abundant source of slave labor for the German war machine.

The machinic phylum is the overall set of self-organizing processes in the universe... in which a group of previously disconnected elements suddenly reaches a critical point at which they begin to 'cooperate' to form a higher-level entity.

MDL I agree with you. The self-organizing machinic phylum is beyond good and evil; it's a very Nietzschean thing. To me, it's much more interesting to know about the birth of a hurricane, how different self-organizing phenomena form it, than it is to consider the destructive effects it can have when it finally hits a human community. Of course, it would be absurd to try to take an ethical position with respect to a hurricane, and what I'm arguing in *War in the Age* is that it's the very density of human biomass that produces transitions of power, not the idea that when similar minds or representations come together something happens. For example, in ancient agricultural societies there existed what were called redistribution networks in which, without wanting to take over, members of the community began intensifying production and then after acquiring prestige they burn all the surplus in a big festival, a feast for the whole community, and then they start building up a surplus again. But the moment you don't burn it, the moment one of those people takes the surplus and builds it, you have the beginning of a state. That's what a state is – a surplus of grain that allows you to start division of labor and so on. It's really just phase transitions that happen to humans, but that humans really don't do much to cause.

There seems to be a fundamental disjuncture between the moral flourish at the end of the book, which frankly strikes me as a sop for your left-liberal readers, and what I would argue is your real position – a chaos theory of societal evolution that posits human history as a series of phase transitions in which the ethics and ideas of individuals are of little consequence in the turbulent whirl of the machinic phylum.

MDL You have to bring in ethics, but at the end; I do have an ethics, but it can't be introduced at the beginning of the book. You have to deal with vast quantities of human flesh, and what that does as a dynamical system, which is why I detached myself and used the persona of a robot historian – so that I could talk about human biomass without ethics. Then, you bring your personal ethics into play, which in my case are that I hate concentrations of power, priestly or military, and would like to see them dismantled and dissolved. A machine like the CIA can be dismantled; it's just human biomass coagulated institutionally. It can be taken apart, like any other machine.

MP My politics is more a question of escaping from what would seem to be inevitable, so I created an organization that allows people to isolate themselves in a monk-like fashion from the pull of the culture – the things that force people to do things that are against what I consider to be their better nature, namely the unrestrained expression of their imaginations and their possibilities. The moral side of this is knowing where to stop. It's like owning a gun: you can use it responsibly, or not. I've been able to create a situation where I've dealt with very extreme, intense technologies in a way that doesn't trouble my conscience, because I've been irresponsible in the good sense of the word, proving that it's possible to act and move in an unrestricted way. Of course, it also proves that you can basically create your own prison, because it's saying that there's a real limitation to what we can achieve.

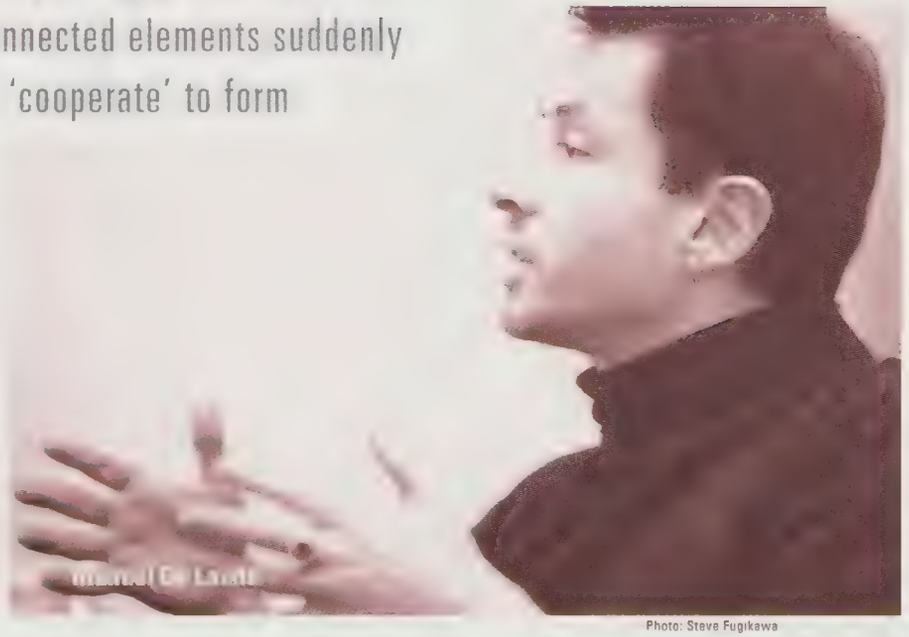


Photo: Steve Fugikawa

It sounds as if you're saying that SRL is a social simulation in which you have the illusion of unrestricted movement, politically speaking, but which nonetheless exists within the larger reality of a society where your movements are bounded on every side.

MP Yeah, of course. It's like a game, but to me playing that game is a road to achieving a better result than playing with the culture.

MDL If, in fact, we are just conglomerations of biomass that have gone through three separate states – nomad-gatherers, agricultural states, and technological urbanization – while leaving many others unexplored, and if I'm right that one of the main forces in our time is that of disciplining materials, languages, and human beings so that they are homogeneous (with a lot of military input because the military is the institution that standardizes and rationalizes), then spaces for experimentation like SRL afford the opportunity to isolate yourself at least temporarily from normalizing forces. They allow you to experiment with collaging things out of heterogeneous elements – in Mark's case, cows' heads and machinery.

MP Really, it's just an admission that there has been enough rationalization and organization. People don't have the confidence that they can get rid of the baggage of structure; there's this paranoia, just when we're on the cusp of a historical era where we can relinquish some control and interesting things will occur. But we're stuck until we realize that you can achieve the effects of a structured organization while being very unstructured or only paying the barest attention to structure, ad-libbing it. For me, the important thing is to prove that, in the very hermetic, monkish world we've created at SRL.

MDL The ethics here is an ethics not of good and evil but of the homogeneous versus the heterogeneous, linear predictability versus experimentation, combining flesh and metal to see what happens. We thought everything was so simple and linear but the fact of the matter is that there have been, throughout history, many missed opportunities for human flesh to go into a different attractor. We assume that civilization is the terminal state, and what I'm saying is that this is not the terminal state; it's just a coagulation that happened historically and might just as well not have happened. ■

ACCORDING TO ANDREW ROSS, THE ACADEMIC ESTABLISHMENT HAS A CONTRACT WITH CORPORATE AMERICA. IN HIS LATEST BOOK, "THE CHICAGO GANGSTER THEORY OF LIFE," ROSS TAKES OUT A CONTRACT OF HIS OWN.

by McKenzie Wark

WHETHER HE LIKES IT OR NOT, PROFESSOR ANDREW ROSS IS A CELEBRITY. THE DIRECTOR OF THE AMERICAN STUDIES PROGRAM AT NEW YORK UNIVERSITY MAY EVEN BE THE FIRST INTELLECTUAL TO TAKE INTO THE POPULARIST MAINSTREAM THE PRACTICE OF USING CRITICAL THEORIES TO ANALYZE HOW POPULAR CULTURE WORKS.

The mainstream is, of course, resisting. *New York Magazine* despatched Rebecca Mead to do a knife job on the budding star. In her story, Ross comes up with some of his famous ironic provocations. On his move from literature at Princeton to NYU: "I am glad to be rid of English departments. I hate literature, for one thing, and English departments tend to be full of people who love literature." And, he might add, are pathetically easy to scandalize.

Ross defends his "post-disciplinary" program as a timely necessity. "The disciplines are for the most part a hundred years old, and I don't think they are going to last much longer." The cultural studies scholar, Ross, wants to create programs that shape a critical knowledge that deals with the present forms of power and culture. The journalist, Mead, can only see this as "pandering to a post-literate society." But perpetuating past fashions in knowledge, like literature and sociology, isn't of itself a critique or a resistance to "post-literate" nasties. Like many journalists, Mead likes her academics musty and irrelevant. Academics on the case of power and knowledge in the present smell too much like competition.

Ross has annoyed the scientific community, even more than the media, by daring to treat the rhetoric and cant of science and technology as a problem of culture and power that affects everyone. As he states in his new book, *The Chicago Gangster Theory of Life*, "arguments taken from natural science are employed to lend substance to social and cultural policies." To give one example: scientists who take grants from the Water Board, and then make statements in the media dismissing fears of algal blooms emanating from poorly treated waste pouring into the ocean. As far as Ross is concerned, such statements are fair game.

The connection between culture and nature works both ways, and science mediates the relation between them. "Ideas that draw upon the authority of nature nearly always have their origin in ideas about society." At the beginning and end of 'science' one always finds metaphors, and where one finds metaphors one finds the power and prejudice of the culture of the day. And whether the science is any good or not, if the metaphor is a powerful one, it will find its way through the media into the culture of everyday life.

In *The Chicago Gangster Theory of Life*, Ross has made a contribution to the environmental agenda by picking apart its metaphors and hidden assumptions. He is suspicious of arguments where the limit to resources is used as an excuse to limit human freedom. "Scarcity is a political tool." One presently being honed as a rhetoric friendly to big business, in what Ross describes as a "leveraged buyout of environmentalism." Take as a prime example that insidious bit of Orwellian Newspeak "sustainable development." The phrase is at once meaningless and self-serving for those in the business of development. All that is sustained is the illusion that business as usual can go on indefinitely.

Ross doesn't let social scientists off the hook either. A complex essay on the myth of the 'noble savages' of Polynesia, South Pacific tourism, and indigenous rights, says in passing: "Mead and Heyerdahl saw a career opportunity in the Polynesians." Sometimes 'we intellectuals,' if that is what we really are and not some cosy club of mutual back-scratchers, have to turn against our own.

The new book starts where his last one, *Strange Weather* (1991), left off. There Ross examined the way technology, the future, and science appear as themes in popular culture, and who gets credentialed to speak as an expert on such things. *The Chicago Gangster Theory of Life* traces terms like "scarcity," "nature," and "ecology" through a bewildering array of cultural and media instances. It is because the media freely displace ideas, from science into politics, from politics into the movies, from the movies into the scientific imagination, that we need a "post-disciplinary" kind of criticism. The interesting stuff is always happening between books and TV quiz shows, between learned journals and travel brochures. Only an ironist can trace these relations without that knee-jerk reaction of the culturally insecure – the one that sees any break with unreflected tradition as the end of Western civilization as we know it.

Where I explicitly disagree with Ross is when he says: "modernity has shortened the average community memory of environment, but it has not entirely transformed us into abstract, rootless individuals." This may be nothing more than nostalgia. If we truly had a rooted culture, then roots and traditions would not be such a permanent subject of neurotic hand-waving. We no longer have roots; we have aerials. It is our separation, not only from nature but from culture as a seamless, living community, that makes us search for roots. Roots in 'nature' or roots in 'culture.' Greenpeace calendars with glossy pictures, and a shelf full of 'Great Literature' are signs that neither belong to us any more. We are too self-conscious for either, we "post-literates." Even Ross' half-hearted nostalgia for "community memory" is a metaphor living on borrowed time. In the end, Ross may be too traditionalist and not enough of an ironist for these slip-slidin' times.

WARK: In your new book, *The Chicago Gangster Theory of Life*, you write of 'the environment' being co-opted by the New World Order. What exactly do you mean by that?

Ross: Well, it happens all the time. There is a history of this to draw upon. The reason I wrote the book was to produce something for the environmentally weary. People who are not particularly involved in environmental issues, but who pay lip service to them. Who pay lip service to ideas about nature and the authority of nature, and tend as a rule to accept what they take as the given wisdom of environmentalism. One of the most provocative ways of challenging that very easy acceptance is to show how ideas about nature that have come up through the environmental movement had actually been taken up as part of the 'New World Order' paradigm, as it were.

Can you give me an example?

A very concrete example: the most recent advertising poster for the U.S. Marines is an image of Marines landing on Pendleton beach in California. On the beach is a huge image of a western snowy plover, which is one of the birds on the endangered species list. The caption on the poster is: "we're saving a few good species." Which is obviously a play on the unofficial motto of the Marines, about "looking for a few good men." This poster came out around the time of the Haiti crisis, and has a certain resonance if you think of the Marines as one of the leading executors of Social Darwinism in the Third World for the last century, at least dating from the Hawaiian coup of 1893. So there are all sorts of ironies in a poster like that.

In terms of the hearings that are staged for appropriations, which is how the military budgets get set, the people who are doing most of the successful pleading are the 'environmental security' officers, who have been appointed in various branches of the military in recent years. They go up to Capitol Hill and they talk about how they were down at Fort Bragg last week and the army was doing a *wonderful* job protecting the red-headed woodpecker, building nests for them, and so on. That's one of the ways in which money is secured.

One can point to the centrality of the concept of environmental security now, in international relations. It has had an extraordinary career in each department of political life, not just the military. I think it only came into United Nations usage in 1987, but it was immediately taken up as a principle for organizing against common ideological threats, in much the same way as the communist menace was used before it. I was reading a report that

cited a cartographer from the CIA's mapping department, who was saying that they have completely changed all of their mapping paradigms. What they are asked to look for now, in making out their maps, is the ethnic mix of a particular region and the environmental constituents of a particular terrain. They've redrawn everything with those elements in mind.

So the threats and resources have changed, or rather the rhetoric of threats and resources that are supposedly managed by the military-industrial elite has changed.

Yep. And it's transnational. The security blocs, or rather 'environmental insecurity blocs,' are composed along similar lines to the old alliances of the Cold War. A lot of these things are governed by U.N.-inspired treaties such as the Montreal Protocol and so on, alliances that still form First World blocs. The pattern of North-South relations is still pretty much the same.

Same inequities, different rhetorics to justify it.

Different rhetorics. Also, I would argue, there really are different risks and threats. If you are talking about environmental threats, you are talking about things of such magnitude, that don't respect borders, that don t respect class or wealth. Sure, the wealthy and the powerful can usually create buffer zones around themselves, but things like radioactivity...

Are not class specific!

They are pretty democratic! Pollution is borne in the wind and through the water. There is only so much you can do to mitigate the effects and make them as unevenly felt as possible. Everyone tries to buy security from those risks, but they are of a fundamentally different order of risk than the effects of ideological antagonisms in the Cold War. So there are different issues there.

You write in the book about a "politics of scarcity." Most people think of scarcity, say of non-renewable energy sources, as an objective scientific fact. Can you explain why a critical view is needed on this question of scarcity?

I think most of the ways in which scarcity is used to advance a particular politics is usually on the back of some targeted crisis. In the book, one of the things I do is trace the origins of a certain economic politics or strategy of scarcity back to the fiscal crises that occurred in some North American cities in the 1970s. There's a chapter in which I talk about the fiscal crisis in New York, which was one of the first attempts to break the back of progressive taxation and welfare policies, at the level of local government. It wasn't the first time in New York's history that the bankers had taken over effective power of city governance, but it was the most egregious, in terms of its effects. It marked the end of what people think of as the progressive city. It was so successful, that strategy was adopted at the national level! Pro-scarcity politics and austerity culture began to be the gospel of the day. "Budgetarism" became the economic code word. We were in an era of fiscal policing. Everything was sacrificed at the altar of the budget.

So you think you can trace a connection between the politics of economic austerity to the politics of ecological scarcity, as these terms were deployed by those who had the power to do so in American political life from the '70s onwards?

I think those things ran in tandem. It's not just an analogy. This strategy was also taken up by global institutions like the World Bank, which used austerity policies and still does, in the way it polices national economies in the Third World. A lot of those packages are put together ostensibly as ways of dealing with resource scarcity on the ground in those countries. The logic goes that because of this resource scarcity, social austerity has to be visited on the people who live in these countries. It is quite clear that the whole idea of resource scarcity is manipulated at that point in the name of some crisis.

So what few scarce resources there are on the ground are deployed, not to begin to meet people's needs in those countries, but to serve the interests of the international monetary system. The big drama of the international 'debt crisis' takes priority over the local and everyday crises of people in those countries who can't get clean water or a place to live.

There is a point at which this economic rhetoric becomes very hard to distinguish from whatever is the 'real' scarcity of resources. Given the history of the way in which resource scarcity has been, not so much manufactured – there are very real and particular instances of resource scarcity – but manipulated by the powers that be.

sustainable development

"The phrase is at once meaningless and self-serving for those in the business of development. All that is sustained is the illusion that business can go on indefinitely."

environmental security

"Came into United Nations usage in 1987, but it was immediately taken up as a common principle for organizing against common ideological threats, in much the same way as the communist menace was used before it. "

the chicago gangster theory of life

The metaphor of the successful human gene being like a Chicago gangster demonstrated for Ross what sociobiologists do in general: "project existing social patterns onto the natural world, and then rederive it as if that were where the pattern originated." This vicious circle that the metaphor travels around, provides the basis for Ross' book.

We are asked to accept the consensual opinion of the scientific establishment that certain resource scarcities exist or soon will exist, but as you point out in the book, scientific judgements, which often end up informing policies and having real social effects, are never entirely free of values and presumptions in the first place. And therefore a social criticism of the behaviors of the scientific establishment is not only feasible but necessary.

This is a very big issue at the moment. The intellectuals the American Right wing hire to represent them have opened up a new front in the 'culture wars.' The campaign is fairly well-orchestrated at this point. The idea is to bash back at what they call the "science bashers," which is basically anyone who has been involved in the critical study of science in the last 10 years or so. They are not just after the 'Science & Society' movements, which have been active since the 1930s, but also the 'culturalists,' who are the more recent wing of science studies. The culturalists' work purports to show how certain cultural and social prejudices are inscribed in the processes of scientific inquiry. It's a little different from the sociology of science studies which have traditionally been done. It's a little different also from the 'follow the money' critiques. Right now there is a very volatile, and I think persuasive, cocktail of all of these traditions of the critical study of science coming together. It's having a very potent effect on the legitimacy of certain kinds of research funding, at a time when things are a little tight.

So the Right wing has been bashing back and have rallied around a book published last year called *Higher Superstition: The Academic Left and Its Critiques of Science*. I was one of a whole roster of people who were attacked in the book. One of the favorite and easiest modes of attack is to say that people like myself lack scientific training and, therefore, lack credibility. It's a very important moment, to try to reply to that kind of argument, and put it in its place. It begs the question of how scientific decision-making is done in a society that is so dependent on credentialism.

So on that argument, the only people entitled to a view about science are the very people who have a vested interest in it – scientists. Even though everybody in society foots the bill, and has to suffer the bad effects along with the benefits. It sounds like a fundamentally anti-democratic argument.

The problem is that it's been a long time since anyone could really make a distinction between science and technology. People still think of science as a public good: a pool of knowledge produced for the public good and available as public knowledge. Technology is the name given to the commercial development of that knowledge. There is a very early point now in the process in which scientific knowledge is whisked out of the public circuit and into the circuit of private profit. Because of the contractual arrangements that now exist between universities and corporations, which were actively encouraged during the Reagan years, the universities are very much in the business of operating on a pseudo-commercial basis. So it is very important to recognize that you will never know enough! You will never be able to say you have all the credentials to make a statement...

About what is a social, economic and industrial system for the financing of new knowledge and its commercial or military exploitation.

How much do you need to know? How much do you need to know about nuclear fission in order to have a public voice about the cogency of siting nuclear reactors, here, there, and everywhere? That question of how much you need to know is a crucial one. My own position is that the critique of science is very ordinary. Given the massive public skepticism, the massive public anxiety about modern 'technoscience,' dealing with it is something people do every day of their lives. So there is nothing sophisticated about it.

If science were hermetically sealed off from having powerful effects on people's lives, then one could leave the questions about its effects to the scientists alone. But, as you also point out in your book, ideas about the kinds of things in nature that science discovers, often have their roots in ideas, or rather presumptions, about society.

The title of the book itself speaks to an example. It's taken from a well-known book by Stephen Dawkins called *The Selfish Gene*, which was published in the 1970s at the height of the first wave of sociobiology, a very controversial development in the social sciences. It purported to explain and analyze social behavior according to biological precepts. There have been subsequent waves of sociobiology. Brouhaha around the book *The Bell Curve* was a symptom of that. The particular example that I chose was one in which Dawkins compared the successful human gene to the successful Chicago gangster – one who had survived in a competitive and hostile environment, and therefore was, in a very directly Social Darwinist way, a 'fitter' person than others to survive in that environment.

So what I do is analyze the metaphor and show how it is a good example of what sociobiologists do in general, which is to take the existing social pattern and project it onto some pattern in the natural world, as understood in the life sciences, and then rederive it from its new origin in the natural world, as if that were where this pattern originated. So there is a kind of vicious circle that the metaphor travels around. So if *The Chicago Gangster Theory of Life* had an overriding maxim, that's what it would be.

Dawkins' idea of the 'meme,' which is supposed to be to communication science what the gene is to life science, is popular among the cyberspace fans, although Dawkins has clearly not read a lot of what we know about how communication actually works. But it's another example of what you're talking about – the displacement of ideas from culture to nature and back again. Anyway, perhaps what you can claim to be professionally trained and credentialed to do is exactly this: to apply a critical suspicion to metaphors, figures of speech, slippery cultural operations that happen in any statement, regardless of what institution it is buzzing around in – literature, science, politics. A metaphor is still a metaphor, whether it is in a report from the Atomic Energy Commission or *Oliver Twist*. If you are forced into a position of having to ground the legitimacy of what you do, is that not it?

It is, but I don't think it should be the only way, because it is very easy to dismiss that. I think it is important to be able to talk about metaphor and materiality at the same time. A lot of these arguments about metaphors are extensions of materiality.

Materiality in the sense of the concrete powers and effects of institutions, technologies...

Right. And there is a very real sense in which you do need to know enough science. But that is not difficult. That is not difficult for well-educated people. I think that is something one must insist on.

In the book you spend a lot of time hunting down and exposing the origins of metaphors that sometimes appear as natural facts. But you also offer, a little more tentatively, some metaphors of your own for people to think with. One that intrigues me is the chapter where you look at the images of ecology that flashed across our TV screens during the Gulf War, but then you go on to flip it around and ask what it might mean to think about an ecology of images.

That is the most speculative chapter! It takes off from something Susan Sontag said in her book *On Photography*, way back when. Many parts of that book were underpinned by a very moralistic attitude towards the image-world we have created by the flourishing of photography and its progeny. Hers was a very old complaint about the image somehow driving out 'reality.' Something we've heard a lot of in postmodernist studies in the last 20 years. Sontag ended up calling for an ecology of images, by which I think she meant some kind of controlled regulation...

Scarcity!

Right! It was a strange pro-scarcity politics. Somehow the overproduction of images was more than the carrying capacity of our cognitive selves, collectively in this world, could bear or could handle or were naturally equipped to deal with. Those arguments seem to me quite hokey and silly, finally. I decided to examine the analogy a little more closely, in the context of the Gulf War.

All those pictures of oil-slicked cormorants, with the less-than-subtle message – Saddam did it!

I was trying to make a distinction between images of ecology and ecologies of images, which harkened back to the idea in screen studies that you could distinguish between the analysis of the content of images and the analysis of the economy of their production and circulation, which would involve a material analysis as opposed to an analysis of the rhetorics of images.

I see, so if we introduce the notion of an ecology of images, rather than just an economy of images, the metaphor directs us to thinking about the qualitative dimension of the way images circulate and their material effects, not just who owns the media, who makes a buck out it. This is a pressing question, given that we're busy creating whole new ecologies of information on the Internet, with multimedia and so on.

Well, I'm not a delirious cyberbaby. I'm not with those who feel that if you log on pretending to be a black lesbian you then know something about the experience of black lesbians. But I do think there are radical effects and radical changes in social psychology as a result of the new relations of communication, and these are material effects.

If there are two things that characterize your work, one is that it begins and ends with forms of power and culture in everyday life. On the other hand, you talk about global relations of power and communication, global issues of technology and environment. The issue then is that there is no one academic discipline that can claim to be an authority on all of the nevertheless very real connections between all those things. So I'm wondering how one can go about creating and teaching a process of acquiring knowledge of these relations in the world? You are director of the American Studies Program at New York University, so in that capacity I'm asking you, what kind of knowledge do we need now?

Ah... that's a good question. In my days as a student we spent a lot of time in reading groups devoted to Marx and Freud. We were terrorized by the prospect of reading Heidegger. If I was to say to my students now, all things being equal, how they might benefit from a similar reading group, I would suggest a Darwin reading group, which I'm sure is the last thing you or I would have thought of doing. It seems to me to be the important thing to do in the 1990s. My students now are terrorized by scientific authority. Hegel and Heidegger don't seem to bother them at all. They are not even all that interested – for which I am thankful! They are especially terrorized by this feeling of inadequacy, this feeling that they are credentially under-authorized, credentially excluded, from raising their voices around issues where science and technology affect our everyday lives. Part of the task is to make them a little more courageous, a little more confident. And I can't think of a more difficult thing to do right now in the academy, given the entrenchment of the divisions between the sciences, the social sciences, and humanities. ■

resource scarcity

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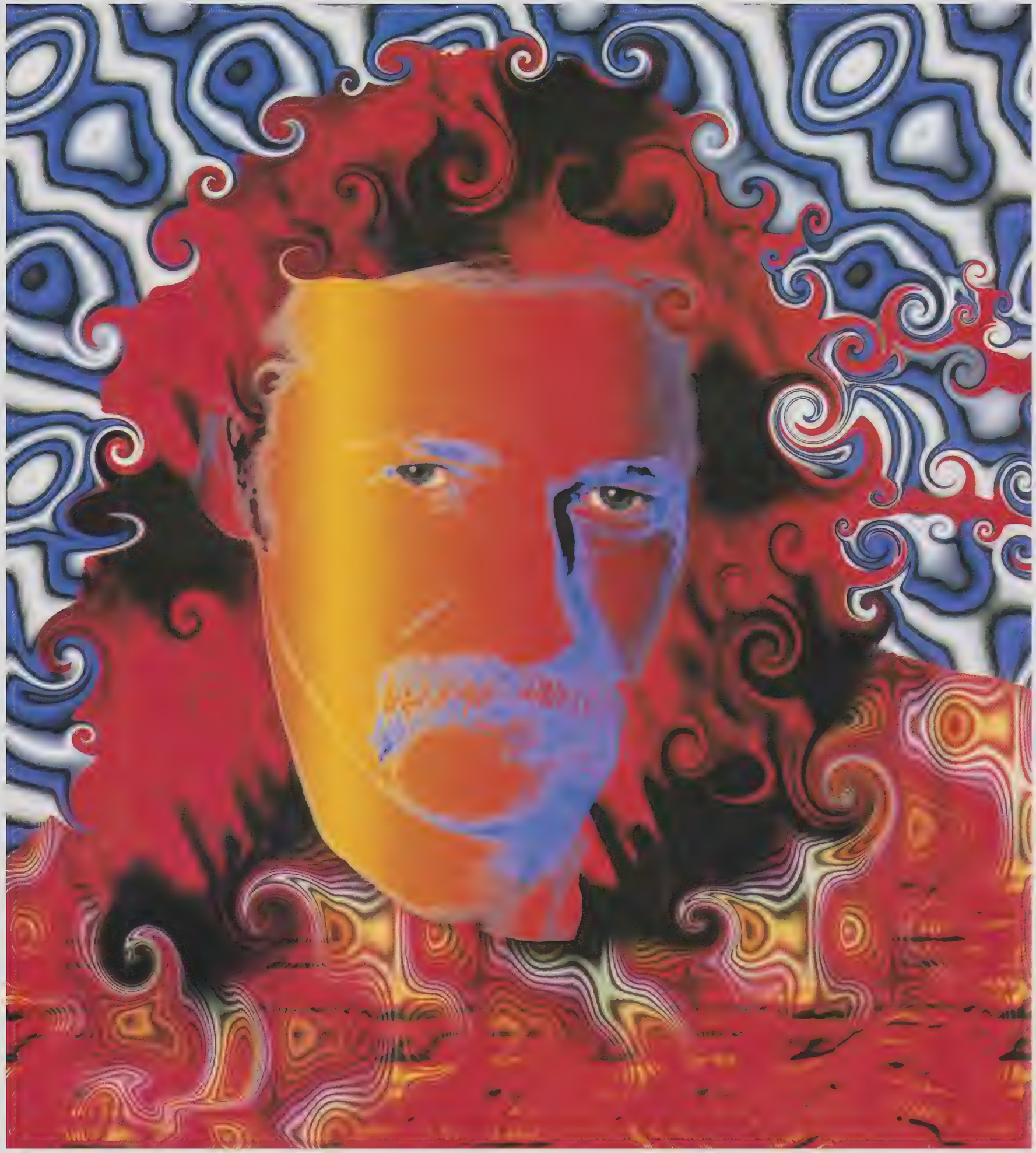


KAI KRAUSE BREAKS RULES AND MAKES ENEMIES.

BUT HIS DESIGNS HAVE MADE HIM THE SOFTWARE MAESTRO FOR THE 21ST CENTURY.

ArtWare

POWER TOOLS TO THE PEOPLE

by Azby Brown

Power im

ALGORITHMIC PAINTING. CHANNEL OPERATIONS. OTHERWISE KNOWN AS "CHOPS Boobonics. The Snowy Mask. Artistic techniques for the turn of the century.

Unconventional though these terms sound, they are nonetheless part of the arsenal of exploratory digital-imaging tools bequeathed to the masses by one man, Kai Krause. Krause is a visual artist, musician, and, significantly for this age, a software designer of eccentric and unorthodox bent. While it is presently relatively easy to locate his activity within the software industry sphere – every application he has released for the Macintosh platform, from *Kai's Power Tools*, to *Bryce*, to *Convolver*, to *Live Picture*, has garnered the industry's highest awards, and most have rocketed to bestseller status within weeks of their release.

In commercial terms, Krause has the golden touch, has spawned at least two fast-growing industries almost single-handedly, and inadvertently stimulated a horde of wannabe's who dream of producing a single hit software sub-application in the Krausian mold. Before *Kai's Power Tools*, who would have dreamed that a wide potential market existed for hundred-dollar third-party imaging add-ons to major graphics packages such as Adobe *PhotoShop*? Or that the best, most communicative way of introducing advanced imaging techniques to a wide audience would be to compile textually irreverent and visually compelling "tip" sheets and distribute them free of charge electronically through on-line services? It may well be that Krause's success and impact heralds the rise of the artist as toolmaker; the interface designer as meta-artist. For while he is disinclined to intellectualize the artmaking process, underlying both the pop exterior of his interfaces and the techno-cool flavor of his own visual work is a near total immersion in the mathematics of electronic color and pattern generation, the algebra of the spectrum so to speak. Surrendering to serendipity and the chance visual encounters that rapidly shifting, glowing phosphors can produce, Krause nonetheless is driven to make such visual phenomena repeatable, to harness the chaos and place it in the hands of other visual creators. He has done much to democratize computer graphics, by making the tools easily approachable, fun, with a touch of whimsy, and extremely affordable.

True, Krause is far from unique in having mastered the craft of computer code in order to further his visual experiments – certainly all of the first generation of computer graphics pioneers and "most of the second" were technicians as well as artists – but few would argue that the direction he has taken is unique. For now, we are in the Clip Art era, where the mass marketing of application-commodities makes it possible for anyone with access to a mouse and a machine to crank 3-D scenes and digital photo composites within hours of opening the box (though one is up and running in minutes with most of Krause's software). True, there is excellent creative work being done with the computer which has nothing whatsoever to do with Krause and his tools; but it is a safe bet that a peek inside the hard drive of any serious (and many dilettante) computer graphic creator will reveal at least one of Krause's *Power* products.

Krause has contributed to the demystification of computer graphics more than anyone else in the field. He is having a tangible impact on creative technique. So why is his face on dart boards?

"I actually get that question a lot," Krause replies, during one of his regular trips to Tokyo. "There are a lot of people who have invested their lives in normal interfaces and so forth... and I've been told multiple times that my face is on dart boards, that certain people do believe I'm the Antichrist. So I think, 'Thank you very much.' I'm flattered. I can understand that if someone's invested themselves in the notion to unify people following what they call a 'positive standard,' then to have me shooting things left and right across that is not exactly fun for them. I'm a thorn in their side when it comes to that.

Artistic intuition: KPT's *Bryce*, with its unlabeled buttons, shows Kai's preference for the user to experiment.

"On the other hand, I hope they realize that I'm doing it for a reason, that it's not just frivolity for its own sake. And we're mixing little teeny tiny ideas as well as really, really big ones. The idea of having round little buttons with depth to them, I would consider that as just my having a little fun. It's me saying, 'Look, you're spending hours and hours with this stuff, it might as well be happy....'

"But the deeper notions, if I took the *Texture Explorer*, and took the round turquoise things and made them square, it wouldn't change what that's about. Now just for the hell of it, and to escape the 'spaceship look,' I'm doing the *Illustrator* vector filters very pragmatic, in white on black, a little shadowy stuff, but very simple...."

Of course, the current flowering of computer graphics was enabled by the Macintosh and a handful of killer apps – such as *PhotoShop*, *Illustrator* and *PageMaker* – which exponentially lowered the level of technical expertise necessary to make and distribute computer pictures. "User friendliness" entered the lexicon a little over a decade ago, when most computer graphics required million-dollar machines and smacked of "demonstration of principle" rather than fluid creativity. To a large degree Apple's interface guidelines must be credited – the style of the icons, the consistency of the commands, the predictability of the dialog boxes – for helping users over the initial hump. Undoubtedly, the importance of these aspects was heightened by the newness of the software and the personal computer themselves. The thinking was clear: standards make the computer easier to learn. Despite the phenomenal growth of other platforms – the WinTel axis, to be specific – the Mac remains the computer of choice for graphics professionals.

One reason, of course, is its consistency; another, and maybe equally important, is the culture which has emerged around it. Where Krause has won "mind share" is by enthusiastically embracing the latter; whereas his willingness to supersede interface standards has made him a hero to serious users and garnered him the lasting enmity of other software producers.

Krause's stance is unpopular among interface designers, among others, he says, "because people always assume that everything has already been done, they end up looking for precedents, to build things on top of other things. We've glorified this notion of people standing on the shoulders of giants, and I'm afraid that in software this has led us to what I refer to as the 'historical accident,' of this ridiculous state we've gotten to in interface design. We've painted ourselves into a corner," he says by way of warning. "These people have been standing on the shoulders of midgets, and they're making it worse at every step Like this thing with 'folders.' If you have 200 of anything, you couldn't do worse than to embed them in little figurines like these Russian dolls, to put things within things which are put in things.... How much worse can you isolate yourself from the content of anything than to encapsulate it 16 layers down like some archeological dig? I don't mean to do away with hierarchy, hierarchy as a concept is a positive thing; it's just the execution of it. I believe there's lots that can still be done. And this is not just idle chitchat – I've been working on this for a long time."

In the eyes of the critics, then, Krause's sins include: 1) not labeling every item in the interface 2) eschewing the use of typical fonts 3) flamboyance 4) other non-standard behavior. He also provides gobs of preset effects and combinations, which means that lazy artists can push a button and collect a design fee (and which has led to a rash of multi-hued fractals and shiny spheroids on everything from CD jackets to rave flyers), and, above all, he sells powerful, thoroughly thought-out software for less than half of what the market has thought such capabilities are worth. In these ways, Krause has pointed out where we currently stand in relation to our computers, what we are capable of, and in which direction things are heading.

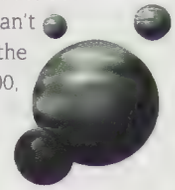
Recognizing that users are ready for more intuitive, slightly unpredictable, and far less condescending software tools, he has devoted his energy to accelerating the process. "I'm not just selling tools for people to get a job done, for production people," Krause stresses. "I'm trying to bring people in that don't really need the stuff, won't depend on it for a living, but just love to absorb it.

"In the case of *Bryce*," he continues, referring to the award-winning 3-D application he introduced last summer, "a few years ago this would have run on a large computer and cost tens of thousands of dollars, and in fact I saw these sorts of things running on military computers just a few years ago. It's all getting so much cheaper so quickly, in graphics or music or whatever."

In terms of the significance of this phenomenon to artists, Krause's thinking is very clear: "The computers we have now are just approaching a 'creative escape velocity' – with the millions of colors, the speed, the RAM – they are just now starting to be able to do things that matter; everything up till now was just the preamble. And the curve is so exponential that we have to be smart enough to realize that we aren't smart enough to know where it'll be five years from now, much less 10.... We can't possibly imagine what it would be like if we had a terabyte of memory and femtoseconds. We can't even imagine what sorts of things will become possible."

And, even though many individual and organizational decisions – including the marketing of potential software – are predicated on anticipating future developments, which leads to a cautious, incremental approach, Krause observes, "People have an incredible inability to extrapolate. Back in 1926 – if you've seen *Metropolis* – people thought the future would be very big knobs; they couldn't imagine computers and electronics, they just took what they knew and made it bigger. And today, we look at what we have, add another zero. And that's not right. The typical things people think we'll have – like speech input – I don't think that's relevant. I work very quietly by myself at night; I'd feel stupid talking to my computer. Of course, we'll have all that, it'll have a role to play, but it's only a small role. We can't imagine the new tasks we'll find, so we can't imagine the kind of interfaces we'll need.

"What we have today is a historical accident; on the big clock it's just a blip. Everything we have today is ridiculous, our children will laugh at us – including my own stuff. It can't be taken seriously." By way of emphasis, he adds, "on the way from the horse to the Model T to the blue Lexus 400, it's a long curve too; we are at about the Model T."



SO, HOW DID KAI KRAUSE GET WHERE HE IS TODAY? HAVING grown up in Germany, where he studied philosophy and mathematics, and learnt classical piano, in his late teens he lit out for the U.S. with two friends – one of whom remains a creative partner, the other of whom he eventually married. Initially, his musical background led him into synthesizers and electronic audio effects. By his own account, the computer "thing" happened partly by chance. "In hindsight," Krause says, "it was almost inevitable, but I didn't know that. I was working with electronic music, synthesizers, computer music, putting things together, writing software. Then in 1982 I tried to write a program to display sound in 3-D. A frequency-amplitude spectrum over time. That program was built into the machine I wrote it on as a demonstration – the *Corvus Concept* – it was like a Macintosh *Lisa*, but a year before. They bundled my program with every machine and paid me $100,000. I realized I might have found something worthwhile to do! I turned that into 3-D business graphics: *Corel* charts, *Persuasion*. I have to chuckle today when I see them because many of the sample files in 3-D they're still using, I made years ago. At the time the contracts even said we were not supposed to say that we did it... so few people know that it's my work. Alas, I cannot believe that it would even still *exist* eight years later... and in many cases *still* not incorporate all that we were going to add next... That whole area needs to be totally re-created from a clear canvas."

In your face: Krause's game-like interfaces combine subtlety and chance.

Nowadays, according to Krause, he does less and less actual coding, and more concept and development. This is partly because the scope of KPT operations has grown so incredibly – from eight people two years ago to over 125 today – and partly because much of his recent work – *Live Picture* and *Bryce*, in particular – is a collaborative production, where Krause provides interfaces and conceptual refinement for software whose basic code is written by others.

Krause has developed a special symbiotic relationship with a gifted young programmer, Ben Weiss, who joined Krause at the age of 19, never having seen *PhotoShop* before. "Many times he simply didn't quite know what was normal, and overshot the target by a mile.... We did all of the *Powertools* 1.0 in four months," says Krause. "I now design interfaces relying on Ben's ability to breathe life into them from the code level. With John Wilczak on the business front, it's kind of like the three musketeers...."

Krause continues his own visual art and design work, including magazine covers, demo images for his own software, and a striking recent ad for Absolut Vodka. In fact, much of Krause's activity is geared towards the graphic art world, and he remains very close to the advertising, publishing, and production professions. This is partly because computer professionals in these fields use their machines and applications intensely, struggling with exacting technical requirements and tight schedules, and, consequently, represent the vanguard of real-world computer graphics use. And, generally speaking, they have embraced Krause's tools enthusiastically, interface guideline infractions notwithstanding. Simply put, Krause has delivered tremendous functionality in a manner which encourages exploration and innovation, which helps a lot of people make money.

To take Krause's first software package, *Kai's Power Tools* for Adobe *PhotoShop*, as an example, it can best be described as a set of interrelated but independent modules whose relationship to *PhotoShop* might be said to be either parasitic or prosthetic. KPT's three primary modules – the *Texture Explorer*, *Gradient Designer*, and *Fractal Explorer* – confront the user with a colorful, game-like interface, sporting a striking graphic design shaded and modeled to suggest three-dimensionality, in great contrast to *PhotoShop*'s stark black and white, flat icon and boxes. From the outset, in addition to (or despite) the funky *look* of its interface, KPT offered intuitive functionality, ease of use, and a compact set of tools capable of generating a literally infinite range of visual imagery and which encouraged exploration and experimentation. It arguably surpasses both Apple's and Adobe's interface standards. That is, KPT makes it easier to manipulate the imagery at hand. Providing controls of great subtlety and nuance, it built upon *PhotoShop*'s fundamental color and image manipulation abilities and the mathematical capabilities of the host computer as well; many KPT images, particularly the complex algorithmic noise of the *Texture Explorer*, relied on random generation of patterns, and so the element of chance was built in.

Within KPT, the process of design became one of random generation, selection and tweaking; of combination and mutation. And herein lies a more fundamental significance: KPT may have been the first artists' tools with visual content built-in. Even *PhotoShop* always presents an empty canvas at first, or one could bring found imagery to the canvas in the form of scans, CD photos, or one could actually draw or paint electronically; but an artist could now simply browse through KPT textures, fractals, or multicolored gradients until she found one she liked, and either use it as-is or, as Krause intended, as a starting point for more freewheeling visual improvization. Whether through design or accident, Krause had become a meta-artist, and soon the

Kai's Sins

In the eyes of the critics Kai Krause's sins include:

1) **not labeling every item in the interface**
2) **eschewing the use of typical fonts**
3) **flamboyance**
4) **other non-standard behavior.**

He also provides gobs of preset effects and combinations, which means that lazy artists can push a button and collect a design fee (and which has led to a rash of multi-hued fractals and shiny spheroids on everything from CD jackets to rave flyers...)

Absolut Kai:
The Absolut Vodka ad created by Kai Krause using his *Texture Explorer* software.

"KPT look" was ubiquitous, though the less easily satisfied were able to utilize the software's deeper capabilities with more unexpected results.

Critics got hung up on how KPT looked. "I didn't make them different just to make them different," Krause says in his defence. "I believe we have new problems that require new solutions. I believe there's a big problem with all these companies going after what they see as a new metaphor.

"New concepts are by definition non-standard – even Rembrandt was all non-standard, man, this whole light and shadow thing... It's very silly to have one look, one standard like *Windows* 95. It's not a feature if we all look the same: it's not a feature if *Windows* programs all look the same. I'm treasuring uniqueness and diversity. Life is all about diversity, we should not be afraid of that."

"The whole key to an interface is the hiding of complexity below. I could change KPT's little green spheres to blue squares, and it wouldn't change the interface itself, the way you remember and explore. My interfaces are all different – like KPT and *Bryce*; *Bryce* is little pictures that move. Every time I do one, it'll still have me in it, you can tell I did it, but it'll be different. And there's a very strict underlying philosophy which I believe is apparent. The first texture interface was 122 sliders; then I had the idea to do genetic mutation, and reduce it to a string of pearls. It's very hard to make it that simple."

"I'm treasuring uniqueness and diversity. Life is all about diversity, we should not be afraid of that."

Indeed one of Krause's routes to simplicity is the avoidance of explicit labels in favor of gentler, more playful, associative iconography. A checkmark can serve as an affirmative symbol, so the letters "OK" are superfluous. Similarly, many of Krause's interface elements recede except when needed, reducing background clutter and allowing the artist to concentrate on the image itself. And, significantly, KPT interfaces invariably re-analogize digital functions – they respond to hand gestures, the physicality of movement, much more than average applications. In some cases, on-screen buttons respond to pressure when the artist uses an electronic stylus for input. In other words, tangible feedback. *Bryce*'s basic interface, for instance, is so simple, and every major function so obviously – and richly – indicated, that one needn't refer to the manual at all during the first few sessions, only later, when "deeper" functions are desired. And KPT *Convolver*'s interface evolves as one uses it, with new functions appearing after the user has explored all the basic ones. This is a radical – and playful – idea which has attracted some opposition, but which is a strong indicator of Krause's future directions: the infinitely mutable interface; a software package with a million functions, of which a single user may use only 600 or so, a fully customized tool set, entirely different from the 600 functions of a colleague. Each of Krause's products is very different, and each represents the reconceptualization of an image manipulation task and an effort to resist the retarding influence of standards set too hastily.

ALTHOUGH KRAUSE IS OBVIOUSLY A TALENTED VISUAL DESIGNER, his true original strength lies in the conceptualization of imaging functions and possible ways of connecting them with human creative behavior. Though input from users, beta testers, family and friends is sincerely sought and responded to, KPT products' consistent excellence is largely due to the operation of an individual creative vision instead of an interface design committee. It is about the intuitive unification of disparate functions, and recognizing patterns within complex, chaotic structures. How does Krause go about it? "The way I work is I spread out all the features, the ingredients, from the largest to the smallest level, on an imaginary, virtual table, and then I look for symmetries. I look for structure; I look for a red line that goes through everything and connects them conceptually... It's not a physical analogy, I don't even imagine putting things out. It's mostly in my mind.. I mostly do it in the shower."

Sketches come at a later stage, Krause says, when his already fully-formed ideas must be communicated to others. But there are other visualization techniques he uses. For instance, "I have what I call my metaphor of boxes. For anything you do in life, if, for instance, I sit here and read this book, there are little tiny decisions you make, like how I move my muscles to hold this book, to hold my finger to flip through one page at a time. There's some very subtle, minute stuff going on in my finger, to hold just one page and allow another to slip by me. It's an incredibly subtle thing. In the process of trying to read the book, I'm automating the process of flipping through it – I don't even think about it. There's a box I can open up which says, 'here's the problem of flipping though one page at a time.' Once I jump into this box, I'm trying to expand it up to 100 per cent size, and solve the problem totally. The trick is to realize that in the big picture, some things are very, very minute – like how to flip through this book – while others are major problems like 'Should I marry this women? Should I have children? Should I jump off this bridge?' Juggling the relative sizes of these boxes is what it's all about, in software or in life....

"I'm looking forward to having enough of a body of work to write a real book about how I think I do these things. But I couldn't write it yet, because I haven't really done it yet. I need another five years."

Inspiration, of course, comes from many sources; in Krause's case, the notion of "mutation" is especially important, and underlies most of his tools in some form or other. "I did the first mutations in my paint program in 1982," he recounts, adding that it was on a now-defunct platform called the *Corvus Concept*. "That paint program was meant to just be for me – I never thought anybody was going to see it. It's kind of like the way Eric Wenger wrote *Bryce* for himself. And it had the interface from hell. Literally. I would paint with my brushes, and I'd hold down shift-control-option-U and it would flip upside down or something. I didn't care. I wouldn't memorize the commands because I'd write the features as I'd go along, and assign them. It was like a living plant. You'd live inside this comfortable pair of jeans. But in there I wrote a whole bunch of stuff which I had never seen before.

"One of them was a video feedback brush, which was a brush with a confined area. You'd take a source, and copy it to a destination. Now normally you'd copy the source and destination onto two different buffers, but I purposely thought, 'Wouldn't it be cool if the destination could self-modify the source as you're doing it.' And actually, that is essentially what the KPT *Texture Explorer* does in the Absolut ad, while *Bryce* and *Convolver* feature their own forms of mutation."

Before there was Kai's Power Tools, however, there was *Kai's Power Tips*, and an on-line community of *PhotoShop* users for whom Krause acted as technical advisor and guru. This community, an extremely active and diverse contemporary salon, communicates primarily electronically through America On-line; Krause's *Tips* have been downloaded over 10,000 times. Of course, this on-line presence has grown along with Krause's company, HSC Software, – several staff members log on daily to answer questions and dispense advice, as well as to simply ruminate. Unlike other software companies whose directors are absolutely unreachable by average customers, Krause participates fully in the on-line discussions. The fact that his whiskered visage is a responsible face, that he has allowed, even encouraged, his personal image to meld with that of his company, is a positive thing, but may be dangerous. It would seem likely that his actual presence must diminish as the company's activities expand. Can Krause maintain the degree of personal contact which has allowed him to reap the "mind share" upon which his success is based?

"I see no reason why not," Krause asserts." You can be highly selective, I can multiplex my time a great deal. I now get about 500 e-mails a week. Yes, I ought to delegate a lot of that, yes I have three assistants helping me answer the stuff, and yes I ought to just forward some of it to certain people, but I take great pleasure in going into detail answering some little kid's question, who never even expected an answer... and people know that about me. Sometimes the mail goes to technical support, 'I've been playing with *Bryce*, I'm 12 years old, and I like the way the sun works, but do you think you could make a moon?' He didn't realize that if you click on the sun there is a moon – and tech support sends me those things because they know I have real fun sending back five lines or so, and the guy gets an actual letter from Kai, and I get something back from him, and so on. And I do that all the time. One of my great inspirations was Albert Einstein and he would do the same thing: he would get letters from little kids in Alabama asking questions about physics, and he would personally answer in longhand. And he would give people advice – and he had a wicked sense of humor – he would tell people things like, 'Dear Christine, my advice to you is to drop out of school immediately, you're much too precious for this.' And he would change people's lives. When she was 45 she met him and said, 'You know, I dropped out of school the next day because you told me to, and I'm so happy I did!' I really delight in stuff like that. So I don't see any reason why that should change."

When all is said and done, the underdog who succeeds in effecting change and making its voice heard is no longer an underdog; rather it will represent the establishment. Once radical tools or concepts fall into common use they also take their place as stones in the wall of convention. It should not be surprising that many voices protest the radicality of Krause's interfaces and the distance he covers in each step. Some seem overwhelmed, and others suggest he rein in his more eccentric and unexpected impulses, to not push the envelope quite as far with each new release. The argument pits the voices of incremental change against those of radical catharsis; evolution versus revolution. Of course he has a business to worry about, and his work does in fact evolve incrementally, only at a much faster pace than all the others. And he is adamant about his principles: "There are a lot of guys who go after the current hot sellers, and just try to do one trick differently, or faster, or cheaper. I always try to do things that are not on the radar map, that nobody has foreseen. Nobody asked me for KPT, and when I had done that nobody asked me for *Live Picture*, and when I had done that nobody asked me for *Bryce*, and when I did *Bryce* they didn't ask for *Convolver*. They're surely not asking for *Amazon*," the code name for a major new graphics application to be released later this year, which Krause hints, "will change the way we work with computers forever in the same way Xerox PARC did with their Windows software." Pushing the envelope? "That's certainly part of the driving principle right there. It's a defined principle for me to say, 'Don't even look for something that's a mere incrementalization of something that already exists.'"

Krause's rising star has attracted major capital investment from key figures such as Microsoft co-founder Paul Allen, and HSC Software has matured from scrawny underdog status to that of contender. And while Krause's partner John Wilczak deserves much of the credit for steering the company through the treacherous and unpredictable waters that are the software industry, the products themselves are primarily the product of Krause's vision and represent the embodiment of his philosophy. Though the futility of prediction would seem to be a settled issue, these products will be remembered as classics, and they, and their immediate descendents, will undoubtedly have great impact on the way we work with our computers in the future.

"One of my great inspirations was Albert Einstein... he would get letters from little kids in Alabama asking questions about physics, and he would personally answer in longhand. And he would give people advice – and he had a wicked sense of humor – he would tell people things like, 'Dear Christine, my advice to you is to drop out of school immediately, you're much too precious for this."

HP=MC^2

The key to success in the IT industry is execution. And execution requires energy and a commitment to getting high-quality products onto the market at the right time, right price and with the right features.

It sounds too easy, really. In fact, Hewlett-Packard has reduced the strategy to a simple formula. It's HP=MC^2. Believe us, a formula like this could explode a few myths and change the world.

The 'MC^2' stands for Measurement, Computers and Communications. These, we believe, are HP's strengths now and into the 21st century.

In a business environment where most rivals share similar technologies, nobody gets light years ahead of the competition. Success is hard-won and long remembered. Hewlett-Packard made the first desktop scientific calculator. That was eons ago – in 1968. The company was a pioneer in the days when PC might have stood for 'pocket calculator'. HP made the first pocket calculator in 1972.

Today, HP ranks first in minicomputers and laser printers, second in workstations, and first in a range of scientific measurement and medical instruments. Personal computers are the company's fastest-growing activity. In 1993, sales of HP products rose by almost a quarter to $US20.3 billion. That's a lot of success and a lot of execution.

In the future, the company will be applying its MC^2 strategy to a new objective: merging its skills and experience into technologies to serve a multimedia age.

This is already happening. Earlier this year, Hewlett-Packard won a contract to supply computers for an interactive television system in the United States. The computers will store the movies and catalogues ordered by the system's subscribers.

Doctors in California are currently testing HP's prototype of a 'physician's workstation' – an MC^2 device if there ever was. The workstation collects medical data from a network of hospital computers that variously contain information such as patient histories and pathology results, and assembles them for assessment on one computer screen.

The company is also working on software systems to make computers easy to use and program.

Further afield, HP hopes to produce a hand-held computer that also operates as a mobile phone, fax machine and electronic mail box. The machine will provide a wireless link to a computerised database or the printer at your office.

Few other companies have the established skills and experience to produce such multimedia devices. As the worlds of measurement, computers and communications come together, Hewlett-Packard hopes to make a unique contribution to IT that the others will find hard to beat.

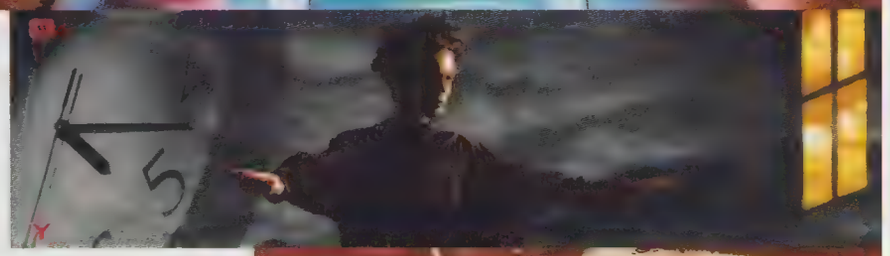
HEWLETT PACKARD

A Better Way.

scan

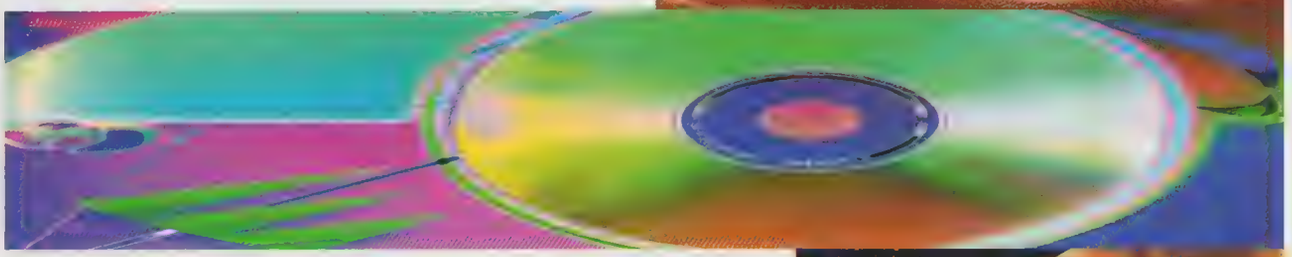
design: the games of the future are played in las vegas

art: after five years laurie anderson hits a nerve



books: imagologies, shadows of the mind and monkey wars

technology: literary classics on-line



astronomy: earth's bodyguard challenges the existence of extra terrestrial intelligence

THE KITSCH CAPITAL OF THE UNITED STATES, LAS VEGAS IS THE TEST-SITE FOR THE ENTERTAINMENT TECHNOLOGIES OF THE FUTURE.

vidi las vegas

BY BENJAMIN LONG

British architecture writer Reyner Banham was the first person to posit the idea that Las Vegas is one giant work of art. Overwhelmed, perhaps, by the "three-dimensional light sculptures" of Las Vegas Boulevard, he went so far as to call it "one of the great works of collective art in the Western world."

Las Vegas works as a piece of art, Banham said, because it tells us "something about greed and elation and fear and daring and compulsion and escape and some of the higher forms of hypocrisy." Well, no arguing with that, but if this city is a work of art, it's one with an overall design style that makes Jeff Koons look tasteful.

And if it is a work of art, then it is one that is constantly evolving. In its most recent guise it has become a test-site for the latest in entertainment technology. Strategically located at the junction where art, technology, entertainment, and money meet, Las Vegas has turned techno city. In recent years a number of enormous hotel/casino/theme park complexes have been built that have changed the face of Las Vegas, as Vegas hotel barons (nine of the world's 10 largest hotels are in Vegas) turn to the latest hi-tech wizardry to transform their kitsch cash palaces into enormous multi-faceted entertainment complexes. And the gamble is paying off – it's boom-time in Las Vegas, which had 23.5 million visitors last year and is the fastest growing metropolitan area in the U.S. Jon Jerde, an architect who worked on one of these mega-resorts, the Treasure Island casino, believes they are a new medium altogether: "It's not a book, a film, or play: it's something else, which splits the line between the ersatz and the authentic and exceeds all normal limits. Vegas is this new medium's experimental first pulse."

To get the full effect, it's best to approach Las Vegas from the air and at night – illusions always work better at night. Fly in during daylight hours and Vegas looks like a monstrous, pustulous carbuncle on the scarred, dry skin of the Mojave desert. But by night it appears as a vast, shining Emerald City, an oasis of wizardry, hope, and light, amid a dark desert of despair. From your first sight of it you get a disturbing sense that Las Vegas isn't quite real, that you're about to step into an episode of *The Twilight Zone*, a feeling that grows the longer you stay and the more you see. This is not altogether surprising if one considers that the city was invented by L.A. gangsters who found the fantasyland of Hollywood a little too down-to-earth for their liking. Las Vegas has always had a rather strained relationship with reality – it is, after all, the place where dreams come true.

As you descend to McCarren airport, one building stands apart amid the neon excess of Las Vegas Boulevard – a 30-storey black-glass pyramid, perched on the southern end of the Strip. It's very lack of neon is what makes it stand out. The recently completed, $US 390 million, 2,526-room, coal-black Luxor almost seems to suck the light out of its brilliantly lit neighbors, sitting on the Strip like Darth Vader surrounded by gaily-clad minions. To complete the look, the world's most powerful light, the 40-billion candle-power "Beam of Light," shoots out from the top of the pyramid like a giant light-saber, cutting a swathe through the desert night. The beam is apparently visible from Los Angeles, 250 miles away, on a clear night and, along with the Great Wall of China, is one of only two human-made objects that can be seen from outer space. Behind its 11 acres of opaque glass, the Luxor claims to be "the most hi-tech entertaiment complex in the world." Its management believes it to be "a prototype of urban entertainment for the future."

Las Vegas is a one-off, an original. Sealed off from the rest of civilization by the Mojave Desert, is a hothouse of money, technical skill, imagination and marketing. Virtual Reality ground-zero. A zone where science fiction is becoming science fact; where the first atom bombs were built and exploded, where NASA's space shuttles land, and where the first reported UFO sightings took place.

This is a city that demands a suspension of disbelief: a short stroll down Las Vegas Boulevard involves a full-scale assault on one's senses – as well as one's sense of history and geography. In a few moments one can step from the Ancient Roman "Forum" shops of Caesars Palace where *faux* marble statues suddenly come to life and start talking, to the South Seas-themed Mirage where a 54-foot artificial volcano blows off at regular intervals, to Treasure Island where, in a million-gallon artificial lagoon, a full-sized mock-18th-century pirate galleon does battle thrice daily with a British man-o'-war: cannons blaze, masts are knocked down and men lost overboard, and the pirates always win – this is Vegas after all. A little further down the road one encounters a rather Disneylandish version of medieval England in the Excalibur, a casino where a reanimated King Arthur and his knights relive the glory of Camelot ("two dinner shows knightly!"). Opposite is the 5,005-room MGM Grand, the "world's largest hotel, casino & theme park" (and, costing a cool $US 1 billion to build, the most expensive). The entrance to the MGM Grand is through the mouth of an 88-foot lion, inside are four separate casinos, the seven-storey high Emerald City dome where the Wizard's Secret Magic Show takes place, and the Deep Earth Exploration motion-based simulator ride, combining "hi-tech audio and projected special effects with state-of-the-art animation." Back over the road again is the Luxor, the overall theme of which appears to be a weird kind of New Age version of some Ancient Egypt of the future (those rooms closer to the center, which allegedly enjoy the benefits of increased "pyramid power," have higher rates).

Being in Vegas is like playing a giant craps game with reality. Throw an 11 and you're in some chintzy casino that's a throwback to the Vegas of the '70s, being served watered-down cocktails by somebody's grandmother dressed in a mini-skirt. Throw a seven and you are in Rio during carnival (except that the rest of the crowd is old and overweight). Throw snake-eyes

EGYPTIAN FAIRGROUND. Douglas Trumbull, director of *Brainstorm* and special effects expert on *Close Encounters* and 2001, created the *Secrets of the Luxor Pyramid Trilogy*. The "highly participatory" interactive adventure combines a high impact simulator ride, computer-animated 3-D special effects, and a seven-storey tall high resolution screen. Above is the monster from *In Search of the Obelisk*. At left is the obelisk, itself.

and you're upside-down and spinning base over apex in a virtual reality flight simulator. Each mega-resort creates its own reality, and wherever you go seems just as unreal as anywhere else.

The VR flight simulator is to be found at the Sega VirtuaLand theme-park located inside the Luxor. VirtuaLand is still one of only a handful of VR arcades on the planet but plenty more are on the way.

Stepping into the Luxor, the Strip-induced disorientation is only heightened when one is greeted by two talking, moving, stuffed "audio animatronic" camels, Elias and Jody, who tell you that it's a long walk from Egypt to the Luxor but that they're happy to be in Vegas. Elias and Jody also reveal, unwittingly, what's wrong with most sci-fi films. In the imagined future of science fiction, whether Utopic or Dystopic or some-where in between, everything has been beautifully and tastefully art-directed. Elias and Jody tell us the future is going to be as kitsch and trashy as the present.

Unlikely as it seems, the old dears at the slot machines, and their equally snappily dressed menfolk, are responsible for making Las Vegas' "experimental new medium" possible. It's their money – 25cents at a time – that built this town, that made it what it is today, and it's their money that is bankrolling the research and development of the leisure pursuits of tomorrow. Remember, when you step inside one of Sega's new pleasure domes for the first time, that a little old lady blew her nest-egg so you could have fun in cyberspace.

Despite an overall Egyptian theme, the Luxor suffers from something of a multiple personality disorder. Stepping up from the gambling floor to the

LUXOR INTERIOR: The Luxor hotel's Attractions level diverges from the hotel's Ancient Egyptian theme into a miniature Manhattan skyline and a Jetsonesque retrofuturistic vision of America in the 25th century where one can step into the Sega VirtuaLand VR arcade.

Attractions Level, ancient Egypt gives way to a miniature Manhattan skyline and a Jetsonesque retrofuturistic vision of America in the 25th century. Overhead, under the "world's largest atrium," a laser light show, beamed from a 110-foot tall obelisk, cuts across the pyramid's interior every 15 minutes. The lasers are bounced off 34 mirrors mounted in the atrium to create a web of light that ricochets around the cavernous space.

In addition to VirtuaLand, other hi-tech entertainment available on the Attractions Level includes the *Winds of the Gods* stage show and the *Secrets of the Luxor Pyramid Trilogy*, which is a cross between a roller-coaster ride and special effects movie. Like everything else in Vegas, the action in the *Winds of the Gods* show is built on a grand scale and includes a chariot race with live horses and a cast that also features camels (real ones this time), zebras, an elephant, and a dozen mummies performing aerial acrobatics. The mummies, it transpires, are none other than the former Rumanian Olympic gymnastics team, wrapped in gauze. Only in the '90s would these former Heroes of Communism be earning a quid entertaining the punters by doing acrobatics in fancy dress in a city that is nothing so much as a theme park for Capitalism. The cast is completed, of course, by a veritable battalion of that Vegas showtime staple – topless dancers.

The *Secrets of the Luxor Pyramid Trilogy* ("In Search of the Obelisk," "Luxor Live," and "The Theater of Time"), is described by its creator, Douglas Trumball, director of the film *Brainstorm* and the man who brought you the mothership in *Close Encounters* and the special effects climax of *2001: A Space Odyssey*, as "immersive" and "highly participatory." This interactive adventure combines a high-impact simulator ride, computer-animated 3-D special effects, and a seven-storey tall high-resolution VistaVision cinema screen. The ride basically involves being strapped into a seat that can move four feet in any direction and being bombarded with sensory input – the seats bounce around in time to the film being played on the giant screen in front of your eyes. In effect you are there – a participant in the movie instead of a viewer – finding the clues and chasing the villains. According to Trumball, as technology stands at the moment his rides are better than virtual reality.

Which brings us to VirtuaLand, where the rides include the *AS1*, an eight-person interactive "Motion Theater" simulator; *Virtua Formula*, a 14-by-50 foot interactive racing game; and the *R-360*, an awesome 360-degree maneuvering authentic dog-fight simulator with a "gyro-moving spherical cockpit system." Hosted by "king of pop and Sega fan" Michael Jackson, a man whose rather tenuous grip on reality makes him the perfect virtual reality host, the *AS1* takes you on a *Star Wars*-like adventure through outer-space – battling some double-crossing aliens along the way – using projected images and four hydraulic cylinders to create the illusion of flying, especially when you crash-land into the mother-ship at the end. Sega's *Virtua Formula* game incorporates the latest in "3-D polygon graphic technology," using a combination of big screen, live monitors and individual motion-based race cars to pit up to eight racers against each other. The *R-360* ride sees you strapped into the cockpit of a flight simulator, which gyrates wildly with the slightest movement of your joystick, and cruising the virtual skies looking for virtual enemies to shoot your virtual missiles at. At the end of the games you have to land your aircraft – or, more usually, crash it – onto the deck of a virtual aircraft carrier.

At the heart of VR's potential – as it has been with all the most successful video games, from *Space Invaders* and *Pac-Man* to *Mortal Kombat* – is violence. Sure, the *Virtua Formula* car racing machines are fun, but the thrills and spills are mild compared to the *AS1* ride, which itself only gets good when the Klingons (or whatever we call the little green aliens) start shooting their phasers at you and you get a chance to blast them into the next world. But for sheer heart-thumping, adrenalin-pumping action, the *R-360* simulator can't be beat. Strapped into your cockpit, your pockets emptied to stop any coins or keys flying out and braining onlookers, you spin wildly out of control with all guns and missiles blazing, chasing Russkies or Iraqis or whoever today's enemies are, around the simulated blue yonder on the screen in front of your face. The g-forces freeze-frame a horrible blood-lust grin across your face while the "Neon Nebulized Nachos" you unwisely downed at the Millennium Restaurant only minutes before are threatening to spray out in graceful parabolas over the VirtuaLand attendant and a gang of spotty teenage youths from Idaho patiently waiting their turn while their parents gamble away their inheritance downstairs. You tumble backwards through these virtual skies then crash into an aircraft carrier because you're too wired on good clean simulated violence to be able to land the damn thing properly. Yes, the *R-360* virtual reality, flight simulator ride simply offers more virtual bang for your buck, and that's where the future of this industry lies.

This, in essence, seems to be the promise of virtual reality. It will not bring about a Brave New World of unlimited potential, nor is it a tool that will bring world peace and better understanding between peoples, nor a better understanding of ourselves and of the human condition. No, the true potential of virtual reality is better video games.

Las Vegas offers us a glimpse into the future. Depending on your viewpoint, it is either a warning of the type of world that environmental carelessness and rampant materialism supported by Protean technology is already building for us, or the triumph of pop culture sensibilities where money, imagination and a touch of madness are making the impossible possible. While Las Vegas is an extreme, unlikely to be replicated anywhere else, most major world cities will soon have a piece of the action, a bit of Las Vegas to call their own. Soon, every major urban area will also have its own VR/hi-tech entertainment theme park. Even if VR doesn't yet quite match the promises made by its boosters, in Las Vegas you can take a ride into the future of entertainment. ♣♦♠♥

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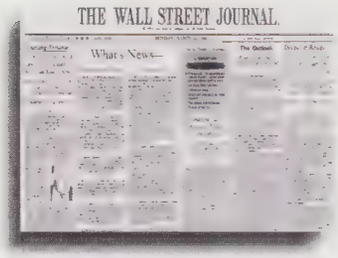

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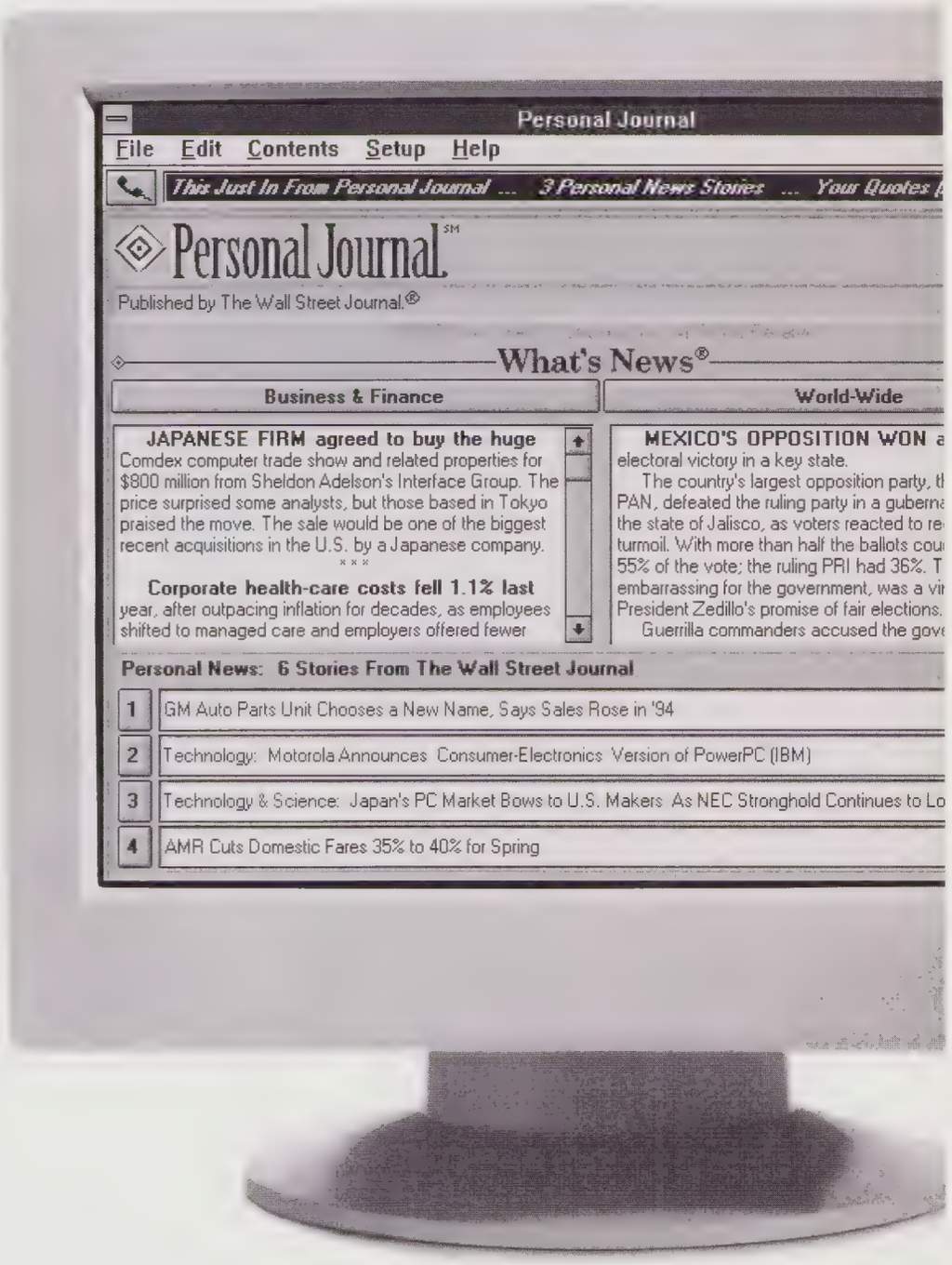

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overground in the heartland

BY WILLIAM MESSER

Laurie Anderson kicked off the eighth week of her 10-week *The Nerve Bible* U.S. tour on the smoke-shrouded stage of a packed Taft Theatre in Cincinnati, Ohio. The original opening had her hanging by her feet above the stage, arms outstretched, as though an inverted crucifix, come to proclaim a daredevil New Testament; the taut suspending rope introducing a recurring metaphor in the performance. But as the necessary, pre-installed rigging was unavailable at most tour sites, the hanging – along with intended flying – was dropped.

Three years in preparation, *The Nerve Bible*, billed as Laurie Anderson's "first major multi-media performance in five years," was presented almost nightly, touring 50 U.S. cities with additional stops in cyberspace via a 'Green Room' area on the World Wide Web, through which Net users could contact the artist and a selected guest. Anderson's interactive debut CD-ROM, *Puppet Motel*, was launched during the tour as it arrived in New York for a four-day stint on Broadway.

Three weeks earlier the tour had also gained momentum with the release of a spoken-word CD *The Ugly One with the Jewels* which featured live recordings in London of readings from Anderson's recent 20-year retrospective book, *Stories from The Nerve Bible*.

The Puppet Motel, co-designed with Hsin-Chien Huang, emerged from the single of the same title on Anderson's Brian Eno-produced CD, *Bright Red*, released in 1994. And ever since Anderson moved in to live with fellow TriBeCa-dwelling musician Lou Reed last year, the two have become the highly visible new First Couple of downtown Manhattan. Reed collaborates on parts of *Bright Red* and contributes pre-recorded vocals to *The Nerve Bible* performance. Anderson is also in the process of developing – with Eno and Peter Gabriel – a music theme park in Barcelona, called Real World. Elements of nearly all this flurry of interactivity show up on *The Nerve Bible* stage.

"Nerve Bible" is an Anderson term for the body, the elemental tool for her art. In one of the show's most memorable visual techno-bits, Anderson approaches the audience in an electronic bodysuit with which she then accesses various percussive sounds by slapping herself in different places. In another, Anderson leans into a microphone with a built-in miniature video camera; a distorted sound emerges as an extraordinary, vortex-like face is projected behind her, an image so disturbingly unfamiliar it cannot at first be recognized as the real-time source of the sounds. Anderson prowls the stage, leans into the bowing of her violin, then returns to her electronic keyboards at the stage's edge. Staccato-edited video projections, from documentational to animated, illuminate three 12-feet screens behind her as well as a suspended sphere and cube above her. The stage set is completed by representations of huge, red, riveted girders flanking and supporting the screens, augmented by smoke machines and lasers.

The heart of *The Nerve Bible* however is the autobiographical spoken-word stories; the most effective connection to her audience. She's at her best here with minimal audio or visual accompaniment, the sound of the words and the images they convey functioning more effectively with less competition. In childhood, Bible stories were "the first really strange stories I remember hearing..." she says. Growing up in a fundamentalist Christian home in the Mid-West, "people really seemed to believe them." She credits the Bible with introducing her to surrealism, while hearing the stories read aloud must have helped the development of her concepts of performance.

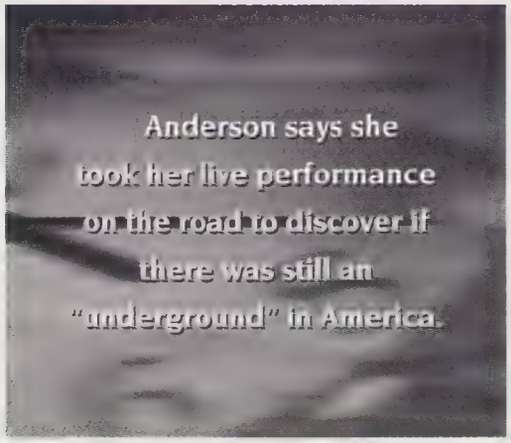
A dodgy fatalism pervades the recent performance as Anderson posits unanswered ontological questions ("Is time long, or is it wide? Are things getting better, or are they getting worse?") among tales of love and loss, death and near-death. The intended opening's suspending rope becomes a "tightrope" in one song, a family bloodline, and an extended laser beamed from the stage. But the evening's most powerful reprise occurs in the central story, which recounts a feverish, hallucinating, body-bagged Anderson being lowered from a 22,000 feet Himalayan mountainside. The three-day, life saving ordeal was assisted by a young American mountaineer who, at Anderson's request, maintained a non-stop monologue to keep her conscious and connected – an aural lifeline. "I was saved by the sound of another person's voice," she says.

In Cincinnati, the spectacle of a rock concert alternated with the warm "electronic campfire" intimacy of Anderson's stories, and the event ultimately assumed the emotive patina of a drive-in church with enhanced AV. The audience, in this citadel city of art censorship, seemed to be a congregation starved for the experience of genuine "art," unmediated by local authorities.

The primary vehicle for this experience is Anderson's voice, delivering words with breathy sonority and pregnant syncopation (described by one local critic as "Rod Serling on estrogen"). In the spoken-word pieces she probed her lower register, occasionally dropping further, to mimic male characters, with the assistance of electronic filtration. Anderson's voice reverberated in a manner not unlike her violin, punctuating the performance with cries and wail-like sounds, offsetting text or melodic expectations. Yet melodies also emerged to enhance mythic storytelling, one of which remained with me weeks later: "Eagle/bites the weasel/weasel keeps holding on."

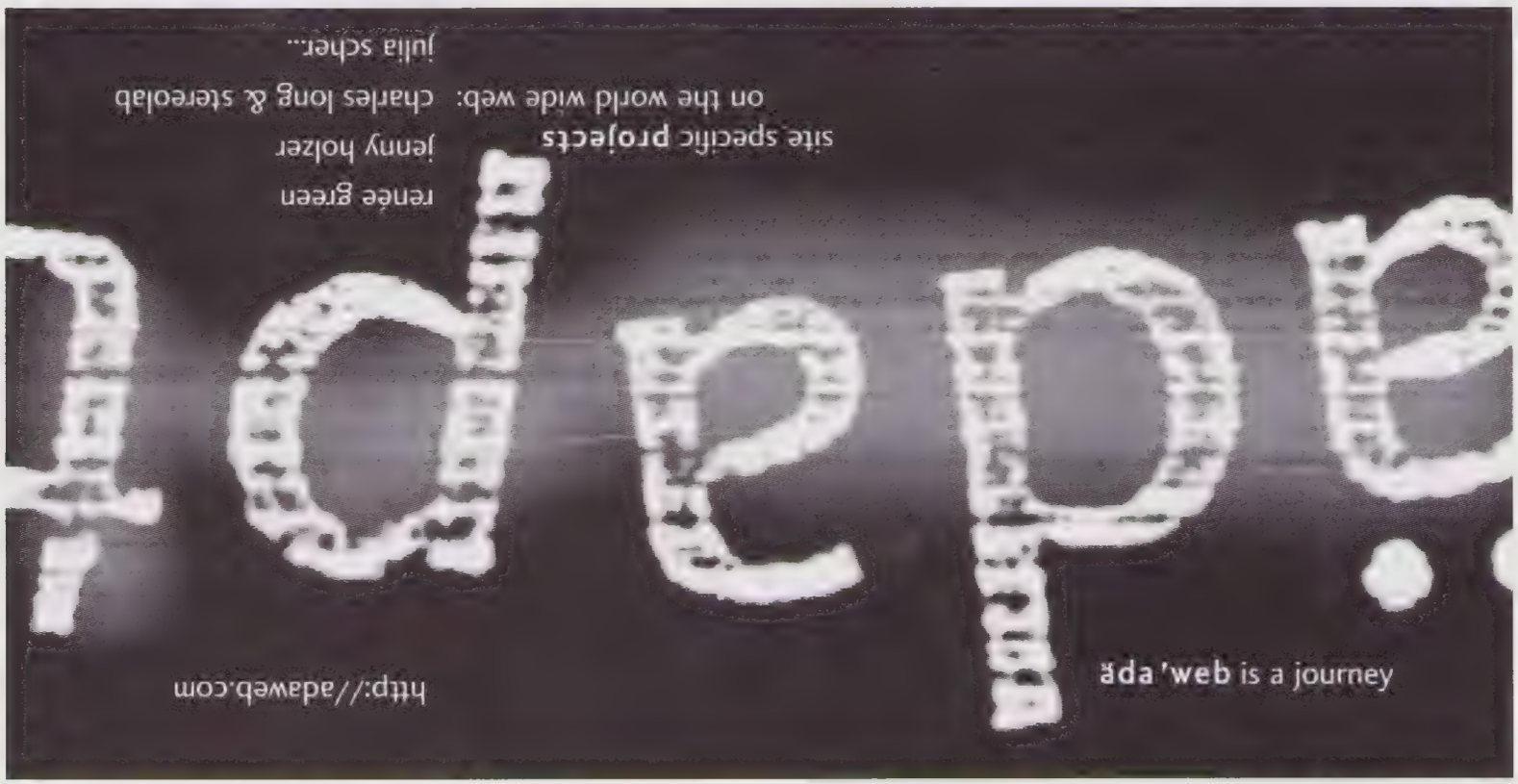
One of the least successful aspects of *The Nerve Bible* involves the pairing of projected video and spoken-word. A clue to the method employed is contained in a work early in the performance comparing the human eye to a camera. "The subjects are often out of focus and poorly lit. The frames are badly cropped. The dolly shots are awful and the pans are a mess. If you saw the dailies, you'd fire the cameraman." But by the time the images reach your cognitive center, the camera

Laurie Anderson credits the Bible with introducing her to storytelling; while hearing the stories read aloud must have helped the development of her concepts of performance.



work seems radically improved. "Your mind has fixed it all up for your eyes." The problem is that as Anderson tells her stories, typically the imagery projected on the screens is superseded by that in the stories, often reducing the videos' impact to little more than that of moving shapes.

Throughout Anderson's nearly 25-year career in performance art she has enjoyed greater commercial recognition than her peers. For most of that time her vocal delivery, physical style, technological obsession, electronic quasi-music and trademark electronic violin have retained a consistently recognizable identity. As with many avant-garde artists who mine a continuing vein, a kind of public congruence can occur as the audience and the times eventually catch up. Anderson's current audiences are likely to be computer-literate tech-heads like herself, an empathetic, artist-friendly assemblage she does not so much shock or astound, but still stimulates and satisfies. Clearly the 47-year-old artist has responded to this public congruence with considerable industry. Anderson says she took the live performance on the road ("a very old-fashioned way of doing things") to discover if there was still an "underground" in America; yet tour promotion and ticket prices appeared geared more to an "overground." The underground now most available to her is more likely to be located on-line than in line, preferring its reality virtual to actual. ■



media mind monkeys

Imagologies: Media Philosophy

EDITED BY MARK C. TAYLOR
AND ESA SAARINEN
ROUTLEDGE 1994
REVIEWED BY DARREN TOFTS

The concept of the death of print has been around for some time now, though Mark Taylor and Esa Saarinen don't seem too worried about it. It's one of the curious ironies of the computer age that the technology of print seems not only to be more conspicuous than it ever was, but that it has proven to be highly adaptable to the stylistic conventions thrown up by new media. It's worth remembering, too, that new edge designers such as David Carson (*Raygun*) and Neville Brody (*The Face*) developed their craft in the print medium before exploding on to the television sets of the world.

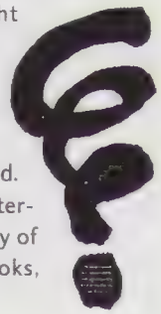
Taylor and Saarinen are aware of the paradox of writing a book about an electronic culture in the process of transplanting print. They attempt to get around this transitional problem by producing a book that works like an electronic text. The result is an eclectic collection of byte-size aphorisms concerning the conditions of life in the "mediatrix," the "electronetwork that mediaizes the real." These snatch-and-run reflections are heightened by a self-consciously "anti-book" style of layout and typography. The idea that we are interacting with electronically charged information, rather than reading a book, comes on strong in the shifting typography, eccentric layout, and overall hypertexty feel of the book. *Imagologies* is all about images, surfaces and shifting traces, and unfortunately it shows. At its best, the book's stylistic quirks draw attention to the process of reading, and to its own material nature as something made of black marks on a white field. At its worst, they are mere ornamentation that does little to radically alter the way we work our way through its pages.

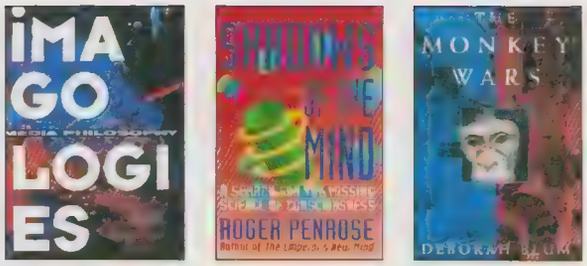
Despite the cyberhype and the insights drawn from postmodern philosophy and critical theory, *Imagologies* is still a book, to be read from left to right, that has a beginning, middle and end. More successful attempts at enabling print to perform communicative functions that it is not really equipped to do have been made. Think of John Cage, or even David Carson. In both cases, the surface of the page becomes a cluttered space where many writings exist at the same time, rather like Gilles Deleuze's notion of the ideal book. *Imagologies* is, in fact, too linear and too print-bound to generate an alternative way of reading that is more like reading hypertext. It is still legible. And that is its problem. Successful attempts at electrifying the printed page are unintelligible. Just think of a Nike commercial.

Fortunately, there is more to the book than an exercise in hypertypography. While the ostensible topic of *Imagologies* is the transition from print to electronic culture, its real theme is the globalization of knowledge. Information, as we know, wants to be free, but it also moves so quickly these days ("On the Net there is no speed limit") that it exceeds our ability to receive and apprehend it: "the speed of information processing is inversely proportional to the rate of retention of the information processed." So much for the computer as a memory machine; one can almost hear Socrates saying "I told you so!" in the background. When we think about the constitution of knowledge as fast information, from the philosophical perspective offered by Taylor and Saarinen, we inevitably come up against the question, How are we to sustain any notion of learning in the electronic age? For Taylor and Saarinen the solution is clear: teleconferencing. They work from the premise that if all reality in the mediatrix is virtual, educators should capitalize on this, rather than lament it, and put the learning process on-line. And this is precisely what they have done, in their implementation of the first experimental, global classroom. Students in America and Finland, seven hours apart, and 7,000 miles away from each other, "met" in a virtual place created by telecommunications technology. In this space they discussed Martin Heidegger on the question of technology, Jean Baudrillard and the culture of simulation, Fredric Jameson on postmodernism, and more. It is predictable that these authors and these concepts should be the subject of discussion in the first virtual classroom, for the logistics of teleconferencing dictate that you not only watch your remote colleagues on a television screen, but watch them watching you into the bargain. Even the global classroom is in infinite regress.

BOOK BYTES: Snatch-and-run reflections heightened by a self-consciously anti-book style.

The account of the conceptual development of this experiment is certainly interesting, and the ongoing e-mail dialogue between Taylor and Saarinen as they struggle to overcome technical hitches and the like offers a fascinating insight into what is involved in creating a niche for the considered exchange and discussion of knowledge in an environment where information flows at rates of kilobytes per second. *Imagologies* may not work as an interactive book, but it generates plenty of thought about the future of books, learning and telepresence.





Shadows of the Mind

BY ROGER PENROSE
OXFORD 1994
REVIEWED BY JULIAN BROWN

Roger Penrose is widely regarded as a brilliant mathematician and physicist. Establishing his reputation during the '60s for his work with Stephen Hawking on black holes and the big bang, he has continued to produce important new ideas in mathematical physics. His latest venture has been to try and make sense of the human mind. *Shadows of the Mind* is the sequel to *The Emperor's New Mind*, a controversial work published in 1989 which was a scientific bestseller in spite of being liberally sprinkled with mathematics.

Provocatively, *The Emperor's New Mind* set out to dispel the notion propounded by the high priests of A.I. (artificial intelligence) that the brain is an advanced computing machine. Penrose produced a kind of mathematical proof that depended upon a mathematical argument put forward in 1931 by Kurt Gödel. Gödel surprised everyone by showing that there are mathematical statements that are neither provable nor unprovable. Penrose adapted the argument to show that there are statements that cannot be proved by a computer *and yet we humans can see they must be true.*

From this, Penrose concluded that human thinking must be "non-computable" because if it could be simulated by a computer you would get a logical contradiction. This in itself was intriguing, but Penrose added to the controversy by saying that the answer to how the brain ultimately works must lie in that other great mystery of science, quantum theory; the theory that describes how matter behaves on the atomic level. In fact he went further than that by claiming the answer must lie in quantum gravity.

For many scientists this sounded like heresy. The effects of quantum gravity operate far beyond the atomic, or even nuclear, realms, way down at unbelievably small scales of around 10 to the minus 35 meters (atomic scales are around 10 to the minus 10 meters). How could biology exploit such infinitesimally small effects?

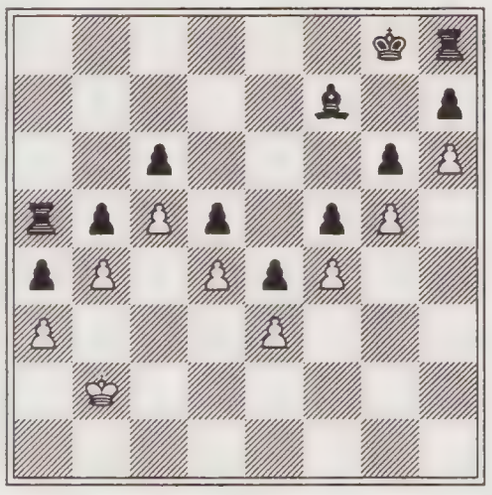
In *Shadows of the Mind* Penrose has returned to answer many of his critics and extend his original ideas. Although, the book occasionally makes references to its predecessor, it is intended to be a self-contained work, so there's no need to rush out and buy the first book as well. Interestingly, *The Emperor's New Mind* provoked the question of who it was intended for. It seemed too difficult for a popular audience and yet clearly it wasn't meant to be purely for professional scientists. *Shadows of the Mind* book will no doubt prompt a similar reaction. Some sections are eminently readable but there are many chunks which I suspect will be way beyond the lay reader. This isn't necessarily a criticism. Penrose freely encourages his audience to skip the more difficult stuff, which is really there for the sake of completeness

The second half of the book is the more accessible. In this Penrose explores in intricate detail many of the most puzzling aspects of quantum theory. If we need a new science to explain the mind, Penrose argues, quantum theory is the obvious place to look. What is new in this book is that Penrose has seized upon a possible mechanism. For some years now a small number of maverick scientists have pointed to mysterious structures within brain cells, known as microtubules, suggesting that these might work at the quantum level.

The evidence for these ideas is very slim, but research into microtubules is still at an early stage. One tantalizing fact is the bizarre range of chemicals that can act as general anaesthetics: nitrous oxide (N_2O), ether (C_2OH_{10}), isoflurane (F_5OClH), and even the chemically inert gas xenon. The question is how do so many chemically different molecules all have the effect of suppressing consciousness? Until recently, no-one has had the slightest idea, but Penrose points at a plausible hypothesis; these substances could all disrupt the functioning of microtubules. If true, this would be an amazing discovery and would help to confirm that microtubules played a critical role in consciousness.

Shadows of the Mind is a formidable mix of mathematics, physics, neurobiology, philosophy, and speculation. If Penrose turns out to be at least half right, then this book will be regarded as a work of seminal importance. If not, it still contains many valuable insights into some of the biggest questions of science.

ROOKIE: A computer that has beaten human chess masters can fail to make simple 'imaginative' manouvers. It is a metaphor that Penrose uses to describe the uniqueness of the human brain and the problems of A.I. programming. This illustration from *Shadows of the Mind* presents the point at which the computer maestro 'Deep Thought' was conquered by a human chess player. In this maneuver the computer failed to move the white king in a stalling tactic which would have left the game in a draw. Instead, it went for the most valuable piece it could and used the white pawn to take the black rook thus breaking the impregnable wall of pawns. 'Deep Thought,' is an example of an A.I. system designed from the 'top down,' thus lacking the potential understanding – and 'imagination' – that would be allowed by the alternative 'bottom-up' programming also explored by Penrose.



Monkey Wars

BY DEBORAH BLUM
OXFORD 1994
REVIEWED BY LISA ROET

ETHICAL DILEMMAS: Highly-charged emotions run throughout Blum's text on animal experimentation. Above is a monkey wired to electric currents to test for specific areas of muscular action and sensation in brain research. The monkey gives an involuntary wink.

Monkey Wars by Deborah Blum is a bleak, though extremely well-balanced, look at the complex political and ethical issues surrounding the controversial research involving primates.

Using personal viewpoints, from those of scientists and doctors specifically involved with monkey experimentation, to those of anti-vivisectionists, Blum demonstrates how the issues surrounding animal experimentation can become confused, and secondary to the power struggles of the different groups; how emotive vocabulary, propaganda videos and advertising, personal vendettas, threats, and violence can deflect from the complex issues that these groups are dealing with. As Blum outlines, it often seems that the sensitive issue of monkey experimentation is more like a war than an intelligent, balanced debate of different viewpoints.

Using any life form for experimentation is a highly emotive issue, particularly when it involves maiming primates, which are biologically similar to humans. Blum weighs the results against the actions with careful regard for all involved. One particularly effective case study involves the search for a cure for polio. Although the discovery of a vaccine was a significant medical breakthrough, it was not without cost. During the height of the polio vaccine research in the '50s and '60s, the U.S. imported more than 200,000 rhesus macaque monkeys for research each year: by the late 1970s there were less than that number of rhesus macaques left in India.

While the number of apes used for the benefit of humanity is a central issue, Psychology Researchers like Harry Harlow's have also involved the isolation of primates proved that family bonding is crucial to the species and monkeys regularly turned to self-mutilation and madness during the experiments.

A Dutch scientist, De Waal, raises the relevant point that "maybe" 1,000 experiments on chimpanzees can find a cure for AIDS, which has infected over 40 million humans, but adds that: "One on one – one chimp or baboon for one human, I'm not so sure that's a good use of an animal."

Because of the vast research proving that primates are complex beings, Blum argues that complex choices must be made concerning their scientific use. With that knowledge comes awareness of the need for ethical considerations.

Perhaps the most controversial issue is that of scientists delving into areas in which they are unqualified. One particularly alarming example is in the area of replacement valves, where transplant surgeons are making decisions about transplanting baboon livers into humans. While these tests are laboratory controlled, there are numerous undetectable viruses that are capable of widespread infection. This is clearly an area where virologists should be consulted. Virologist Jonathan Allan thinks that it means opening a "shadowy Pandora's box of virology.... A single person infected with tuberculosis can bring down a primate colony, just by entering a research laboratory containing monkeys. The path of infection runs two ways between monkeys and humans." Likewise, laboratory assistants and scientists have been infected with monkey viruses.

While this is highly emotive subject matter, the author fails to give enough attention to alternatives to animal research, and what the future holds for primates and scientists alike. Perhaps monkeys are too readily available for scientists, or the results from primate research more reliable.

What was acceptable 20 years ago in the use of apes and monkeys in experimentation is clearly no longer acceptable, as our knowledge and views are broader and more sympathetic to the cause of animals. The public now is able to have power in decision making. Indeed, Blum cites the success of cosmetics companies who are responding to public demand and finding alternative research methods to animal experimentation. If the DNA of a dinosaur can be reproduced artificially via computer technology, one would think that computers could also be assisting the development of alternatives to using monkey organs.

Generally, however, the book does not adequately question what the reasons for the lack of development in alternative research are. Similarly, its focus is on the United States, and offers little in the way of insight into the operations of clinics in other countries – different cultures hold differing views and perspectives which could well be explored.

There are signs for optimism however, and Blum shows us that change is occurring, by both activists and scientists becoming more open and approachable, allowing for change in what was once a very callous world.

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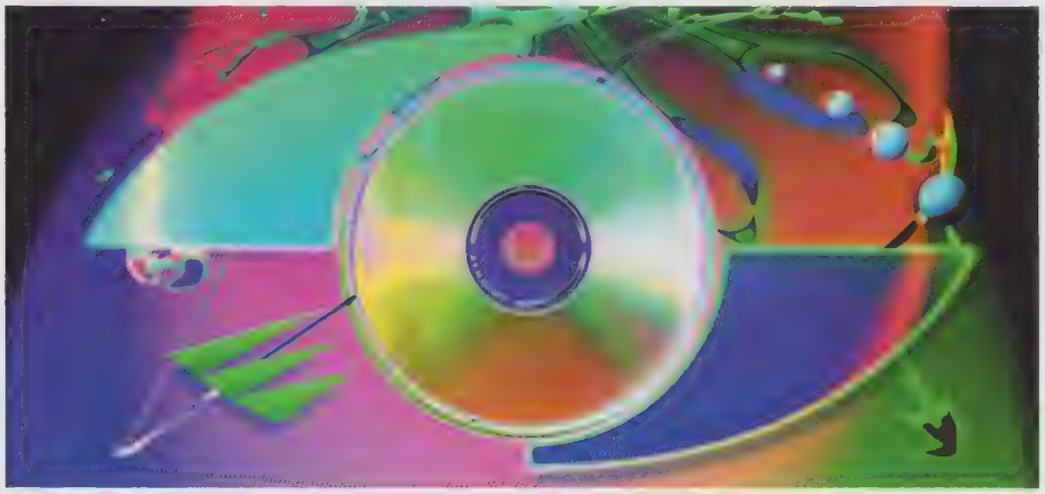
BUT BEWARE OF FALSE ENDINGS AND EYE STRAIN.

virtually a library

BY DOUGLAS D. WOLK



Imagine a huge library, accessible to you in the privacy of your own home, with thousands of books: literary classics from all over the world, up-to-date reference books, sacred texts, you name it. Imagine that you can read any book in it straight through, or find any passage you're looking for with a few moments' effort. That's what computers are supposed to bring into your home.

Now, to extend the analogy, imagine that most of the books in that library are printed on huge, unwieldy scrolls; that they're so heavy that they each take a few minutes to pull down from the shelf, and you can't even think about carrying them around with you; that almost none of them are less than 75 years old; that they hurt your eyes to look at for more than a few minutes; and that, too often, when you try to pull a book down, you find that the scroll is blank, or that you're not allowed to look at the particular book you want. The library would still have its uses, but it wouldn't be the reader's wonderland it was chalked up to be. That's a closer approximation of what it's like to read books on a computer.

Electronic editions of classic books are a nice feature to have on any system: they're fairly compact, and instantly recognizable as something that connotes quality and class. You can squeeze a few thousand classics on a CD-ROM without paying a cent in copyright fees, and still have room left over for a deluxe version of *Tetris*. Practically any academic gopher server or World Wide Web site provides a quick jump to a collection of on-line books, though how up-to-date the list is varies widely.

The best-known source of electronic texts is Project Gutenberg (you can get books from them by anonymous ftp to mrcnext.cso.uiuc.edu in /etext). They encode four or five books every month and make them publicly available. Almost as active are the Internet Wiretap (ftp or gopher to wiretap.spies.com, in /Library) and the Online Book Initiative (ftp or gopher to world.std.com, in /obi), and there are a few other projects that encode Latin and Scandinavian texts – though English, here as elsewhere on the Net, is still the dominant language. Project Bartleby, located at Columbia University, has set up the works of a handful of major poets (Shelley, Wordsworth, Whitman) in World Wide Web-friendly form, making it easy to find specific poems.

Almost all the books in these sites are in the public domain. By U.S. copyright law, any work that's over 75 years old can be freely reproduced – which is essential in the world of electronic media, where the whole idea is to make information available to the public. That's tremendously useful for the texts that are available, but it also skews the collection weirdly toward 19th-century literature and 20th-century freedom-of-information agitators. If you're using Internet resources to study Gene Stratton Porter or the *Book of Mormon* or Hakim Bey, you're set. If you're looking for Ralph Ellison or T.S. Eliot or Fay Weldon, you're out of luck. The King James Bible is easy to find; any other translation isn't.

The variation of copyright restrictions from country to country can result in tantalizing books being frustratingly out of reach: you can only download *Finnegans Wake* from inside Canada, for instance. If it's starting to sound like the capabilities of this "library" are directed toward the needs of the textual scholar, rather than the critic of style and content or the casual reader, that's because they are. Electronic texts are mostly useful for people who want to see the contexts in which Jane Austen uses the word "truth," or trace the concept of kingship in Ben Jonson's plays. For those uses, it's great – a couple of Unix commands, and your research is done in seconds.

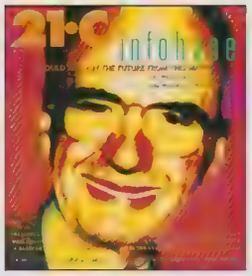
On the other hand, you can pore over a leather-bound copy of Aphra Behn's *Oroonoko* in your office, at your school, or stick the Penguin paperback in your beach bag, and that's fine. But if you try to read it straight through on a computer screen, clicking on the scroll bar every minute and a half, you will get a splitting headache. Curiously, texts of "classics" were often much more mutable until about the period when current copyrights kick in. Samuel Richardson revised his masterpiece *Clarissa* several times, when readers complained that they didn't like certain characters and liked others too much; 19th-century editors ripped apart earlier plays and poems and reassembled them to make them more palatable to their contemporaries.

Since the New Critics, between the two world wars, made the text itself a sacred thing, the fashion has been to publish standardized, definitive editions adhering to the author's intentions. But it's those editions that, perversely, can't be disseminated via the Net. New editions of public-domain works can be copyrighted; some electronic editions set up ornate "copyleft" schemes, which usually boil down to "copy at will and send me money if you feel like it." Still, most downloadable editions go out of their way to dodge the issue, when they mention it at all. Some even have

a disclaimer saying that the source of the e-text bears no responsibility for errors in it.

All of this points to a disturbing problem with e-text versions of public-domain books: they're usually scanned in (and sometimes typed in) from public-domain editions. Either the source or the new version of the text could be tremendously corrupt, and nobody would be the wiser. It's not hard to find publicly available texts with extraneous characters and blatant transcription errors; there's no way to tell how often grosser mistakes (or intentional changes) have been made in preparing them. The Oxford edition of Shakespeare prints the folio and quarto editions of *King Lear* as two different plays; if you download *King Lear* from a public ftp site, though, the edition you get is likely to have no indication of where it comes from, or how spellings have been modernized, or even if it's an edition with an addled editor who changed the ending to Lear, his daughters and the Fool announcing their weddings and dancing around in a circle (yes, that sort of thing exists). An enterprising literary scholar could put together a definitive electronic variorum edition of Shakespeare (or Joyce, or Richardson), scanning in the texts from the original editions, comparing them by computer instead of by hand (which would save a few decades), and setting up links between specific variations. Too often, though, the goal of digitizing books seems to be to scan 'em in and get 'em out, without regard for scholarly apparatus, identifying information or introductory material.

There's one other disadvantage to electronic books, and it has more to do with the people who use them than the texts themselves. Literary scholars – especially those who are fascinated by pre-20th-century literature – may be more likely than anybody else to be fiercely Luddite, resistant to the idea of their beloved books being replaced by soulless electronic media. They have a point. But, given current technology, e-texts aren't really useful for anybody else. While they're a nice thing to have around, for most scholars and casual readers, they're effectively like Jay Gatsby's library: beautifully tooled spines with nothing inside. ■



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IS LIFE ON EARTH A MIRACLE, A QUIRK OF FATE, OR THE DIRECT RESULT OF THE PLANETARY STRUCTURE OF OUR SOLAR SYSTEM. BEN ZUCKERMAN AND PAUL DAVIES CONSIDER THE ODDS.

the jupiter principle

BY ROBYN WILLIAMS

Debates surrounding the prospect of discovering intelligent life beyond Earth continue to blaze. While proponents of the Search for Extra-Terrestrial Intelligence (SETI) believe the odds are good, their dissenters are numerous. Among the latter is Ben Zuckerman, professor in astronomy at UCLA. His theories have come as a blow for those wishing upon a star for E.T. intelligence.

While seti researchers look for radio signals from the heavens, Zuckerman is looking for Jupiters. Jupiter, he believes, makes it possible for life to exist and evolve on Earth. Jupiter acts as a defence shield against asteroids and comets, while Earth's axis is protected by its moon.

It is these solar bodyguards protecting Earth that Zuckerman believes have allowed the evolution of intelligence and, he says, it is a situation likely to be rare elsewhere in the cosmos. His approach has been perceived as a pragmatic analysis which dramatically reduces the odds for intelligent life elsewhere.

Professor Paul Davies, on the other hand, in his recent book *Are We Alone?*, contends that current science and astronomy have far too little knowledge of the universe to make such assumptions about the uniqueness of Earth's solar system, let alone the likelihood of intelligent life-forms in other systems.

As the Earth's sun is estimated at about 4.5 billion years old, Zuckerman and his researchers began searching for gas near young stars – with ages estimated between a few million and 10 million years and with more or less the mass of our sun.

"The reason we chose those ages is because the best models that planetary scientists have made to date of the way that Jupiter formed, is during the course of about one million years after the time that our sun formed," he says.

"The purpose was to see whether there was enough gas near the stars to make a planet like Jupiter, which is mainly made out of hydrogen and helium gas."

However, after studying up to 20 stars, the team had not found enough gas around those stars to form a planet with a mass equivalent to Jupiter. "If we had found gas it wouldn't have proven that planets like Jupiter were in fact forming," he admits. "But if you don't find gas then, at least at this stage in their history, these stars cannot be forming Jupiters.

"The core of Jupiter is made of rocky silicate material, such as the Earth is made of. In addition, at Jupiter there are frozen ices. The core of Jupiter, which was, say, 15 Earth-masses in total, formed during the first one million years. Then the gases were pulled in by the gravity of this core over the course of the next nine or 10 million years. So, according to the best models we have of the formation of Jupiter, if they are correct, then to form a Jupiter it takes around 10 million years to pull in the gas."

So while Ben Zuckerman searches for planets in other solar systems with similar masses and gases to Jupiter, Paul Davies questions whether UCLA's professor of astronomy is being rather limited in his research and assertions.

Professor Zuckerman, your theory is based on the presence of Jupiter protecting Earth from asteroids, and the presence of the Moon to create an equilibrium for our planet.

Zuckerman: If we did not have a large close moon to stabilize the spin axis of the Earth, it could have varied by many tens of degrees; with drastic implications for the climate of Earth, and devastating consequences for life here. People think that, if the spin axis varies by even as much as one degree from its present tilt, to about 23 degrees, it is enough to have been a major cause of the ice-ages millions of years ago.

That our solar system contains a Jupiter, and the Earth has a large, close moon in orbit around it, at first seems to have little or nothing to do with our existence. Yet either one, or both, of these phenomena are perhaps critical to answering the question of why we are here.

Davies: There are a long list of things that you don't want if you are going to have life, at least life evolving to the point of intelligence. The argument that the SETI enthusiast will use is that there are an awful lot of stars out there, and you can eliminate 99.9 per cent and still have a lot of places where life could originate and evolve. I would be incredibly excited if it just turned out there was one other planet in our galaxy that had intelligent life on it. One is enough, really, to make the point, so there is an awful lot of spare capacity, we might say, in the cosmos.

Just because there may be some rather stringent conditions for life, doesn't mean we should rule out that possibility. If you look at the range of habitats on Earth where micro-organisms can survive – ranging from incredibly hot springs on the ocean floor to Antarctica – the level of single cell organisms reveals enormous versatility. It could well be that circumstances that we would regard as very hostile in the universe would still be okay for microbe life. But intelligent life, I agree that is much more of a problem.

What's the significance of assuming that by implication Saturns and Jupiters are rare?

Zuckerman: There are at least three different reasons why it is extremely interesting that Jupiter-like planets are extremely rare. On a philosophical level, we are looking at a big picture. One of the basic tenets of modern astronomy is that we are not special, this goes all the way back to Copernicus in the 16th century. Copernicus removed the Earth from the center of the solar system and put the sun there. Ever since then various discoveries have shown that we are not particularly unusual or special, so if it turns out that a planetary system that has a Jupiter and a Saturn is unusual or special, then this contradicts the Copernican world view, which is accepted amongst so many astronomers today. That is one reason why this is a very important finding. Even if there are other solar systems out there, they look very different from our solar system, and our solar system is in some way special.

A second potential reason why this may be important is that if our solar system is special, then it is possible that life on Earth may be special. George

While SETI researchers look for radio signals from the heavens, Zuckerman is looking for Jupiters. Jupiter, he believes, makes it possible for life to exist and evolve on Earth.

Professor Paul Davies believes that current science and astronomy have far too little knowledge of the universe to make such assumptions about the uniqueness of Earth's solar system, let alone the likelihood of other intelligent life-forms in other systems.

Illustration: Norm Robinson

EARTH'S BODYGUARD: Fragments of the cosmic ice and dust of the Shoemaker-Levy 9 comet smashed into Jupiter last July. If Jupiter did not regularly take cosmic blows, the rate at which Earth would be hit by [illegible] could be 1,000 times greater.

Weatherall, who makes model solar systems in his computer, has even presented a reason why a solar system without a Jupiter may not be able to form life, even if you have an Earth-like planet.

His argument is basically that when our solar system formed, 4.5 billion years ago, there were lots and lots of comets and asteroid-like objects out where Jupiter, Saturn, Uranus and Neptune are. Over the course of hundreds of millions of years, the gravity from Jupiter, and to a lesser extent Saturn, swept the solar system clean of these comets and asteroids. Jupiter ejected them from the solar system, so that during the last four billion years the rate of impact of such objects – objects, say, the size of London or Sydney or New York, one of which may have wiped out the dinosaurs 65 million years ago – these impacts on the Earth during the past four billion years from such objects have been relatively few and far between.

The kind of impact that occurred during the time of the dinosaurs is believed to have taken place only about once every 50 to 100 million years – that's thanks to Jupiter acting as a giant garbage collector, a place where we have gotten rid of most of the debris in the outer solar system. If Jupiter was not there, the rate of impact should be perhaps 1,000 times greater than it actually is, and Earth would have been hit by a city-sized asteroid every 50 to 100 thousand years rather than every 50 to 100 million years. This rate of impact may be so great as to make it impossible for life to originate and/or evolve on an Earth-like planet. So the absence of Jupiters may have surprisingly significant, fundamental implications for the prevalence of life in the universe.

Davies: It's very easy to look at our solar system and decide that there are many aspects of it which are really rather special, and therefore we on Earth are unlikely to be repeated elsewhere. The truth of the matter is we don't know what circumstances are needed for life to originate in the first place. We have no idea how life originally formed, or indeed, whether it formed on the Earth or came to us from somewhere else. We don't know that, and we have no real idea of the circumstances that are necessary to drive evolution to the point of intelligent life.

It is interesting that you should mention the asteroid impact, because some people believe that, as far as evolution is concerned, asteroids are good for you, that getting zapped occasionally kick-starts evolution. It is often said that if dinosaurs hadn't been wiped out, that the little furry mammals would never have evolved to the point of human beings and intelligence, that there would still be these great blundering reptiles. So a certain amount of impacts is good for you.

In attempting to assess how often impacts are likely to occur, you have to make all sorts of assumptions of objects which we can't see and can only infer out there. I'm talking about comets, which are in the so-called Earth cloud, we believe about a light-year away from the sun. Now, this is simply inferred, we really don't know where comets come from, how many are out there, what it is that perturbs their orbits and so on. So we are heaping conjecture upon conjecture, theory upon theory, so that Jupiter is clearly a part of the picture, but I would say there are far too many unknowns to draw conclusions one way or the other.

But being zapped every 50 thousand years is much worse than being zapped every 50 million years.

Davies: I don't know what the optimal zapping interval might be; 50,000 years would make me feel a little bit uncomfortable. There are undoubtedly many factors that go towards the origin of life and the evolutionary path. I don't believe that we know the answer to whether or not we are alone in the universe. It is entirely possible that life is widespread throughout the universe, but very rarely makes it as far as technology – in which case the SETI program is in trouble. It could be that micro-organisms which can survive these sorts of violent events are fairly common.

It could be that life is unique to Earth. I don't have a pre-established position, except that I don't like to believe that life is a miracle. I don't like to believe that life is originated on this planet as a result of something miraculous, but that it emerged as part of the normal workings of the laws of physics. Our intelligence is not a miracle, but is part of the normal laws of physics. By the same token, the standard biological position that these are not miracles, but stupendous improbable accidents, thus making life and human beings really rather trivial, just a little quirk that occurred on some planet that is a little atypical in some remote corner of the universe, I find a very depressing view of the universe. But as a scientist I would be prepared to accept it if that is what the evidence suggested.

ILLUSTRATION : TROY INNOCENT

MIND GAMES

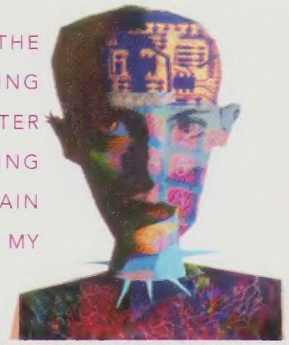
Fred Harden is a regular columnist for *21•C* and the editor of *MultiMedia* magazine.

UNPLUGGED

"Assuredly, diversity will reign. A million technozines will bloom. The new world may not be *Mondo*, but at least the revolution will not be *Wired*"

R.U.Sirius is co-founder of the cyberculture magazine, *Mondo 2000*. He writes regular monthly columns for *Esquire* (Japan) and *Wave* magazines, and is contributing writer to *Wired*, *Mondo 2000*, *Might* and *bOING bOING* magazines. He has recently completed two books, with St Jude: *How to Mutate & Take Over the World* (Ballantine Books) and *The Real Cyberpunk Fake Book* (Random House).

"I IMAGINE THE COMPUTER GETTING FATTER AND FATTER AND NOT ALLOWING ME TO DREAM AGAIN AND SUCKING OUT MY THOUGHTS"



ACKER ON-LINE

Rosie Cross is a freelance radio producer, writer, video-maker and self-proclaimed geek girl who lives in Sydney. Her last story for *21•C* was an investigation of sexism on the Net. e-mail: >rosiex@jolt.mpx.com.au<

THE OMEGA MAN

"A day will come when it will be possible to resurrect every being that has ever lived" – Frank Tipler

Nick Marinello is a senior editor in the Office of University Publications at Tulane University, New Orleans.

DEUS EX MACHINA

"We live in a deodorized society that tries to eliminate intensity as much as possible" – Manuel DeLanda

Mark Dery is a cultural critic. He edited *Flame Wars: The Discourse of Cyberculture* (Duke University Press, 1995). His inquiry into fringe computer culture, *Escape Velocity: Cyberculture at the End of the Century*, will be published by Grove-Atlantic in Fall, 1995. His last story for *21•C* was a reconsideration of Marshall McLuhan. He welcomes e-mail at: >markdery@well.sf.ca.us<

"Tipler's God is such a fleeting, final instant, that he is really not worthy of being called divine"

IMMORTAL COMBAT

Robyn Williams is a director of the Australian Commission for the Future and director of the ABC Radio National Science Unit.

CONTRACT KILLER

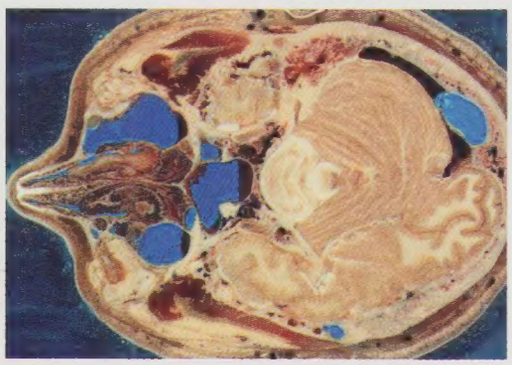
"Things like radioactivity, they are pretty democratic" – Andrew Ross

McKenzie Wark lectures in communications at Macquarie University, Sydney, and writes a column for *The Australian* newspaper. His book *Virtual Geography: Living With Global Media Events* is published by Indiana University Press. His last story for *21•C* was on the rise of the new Right. e-mail: >mwark@laurel.ocs.mq.edu.au<

"There is an intimate and possibly subversive element between women and machines"

CYBERGETTES

Rosie Cross interviews Sadie Plant



ANATOMY OF A MURDERER

"As Jernigan's organs were poisoned by barbiturates they could not be transplanted, so other uses were considered"

David Ellison is a freelance writer based in Sydney.

YEN ZERO

"60,000 would die, up to a hundred thousand would be seriously injured, there would be $US 1.2 trillion in damage, and between $US 500 million to $US 1 trillion in business disruptions"

Adam L. Penenberg is a New York-based writer and contributor for *The New York Times*. His last stories for *21•C* were on Telesurgery and HDTV.

"THE ULTIMATE WORLD-HISTORICAL SIGNIFICANCE – AND ODDITY – OF LOS ANGELES IS THAT IT HAS COME TO PLAY THE DOUBLE ROLE OF UTOPIA AND DYSTOPIA FOR ADVANCED CAPITALISM"

FUTURE NOIR

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Azby Brown is associate professor of architectural design at Kanazawa Institute of Technology, Japan. His books, *The Genesis of Japanese Carpentry* and *Small Spaces*, are published by Kodansha International. He writes for *World Art* magazine.

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Benjamin Long is a Los Angeles-based writer.

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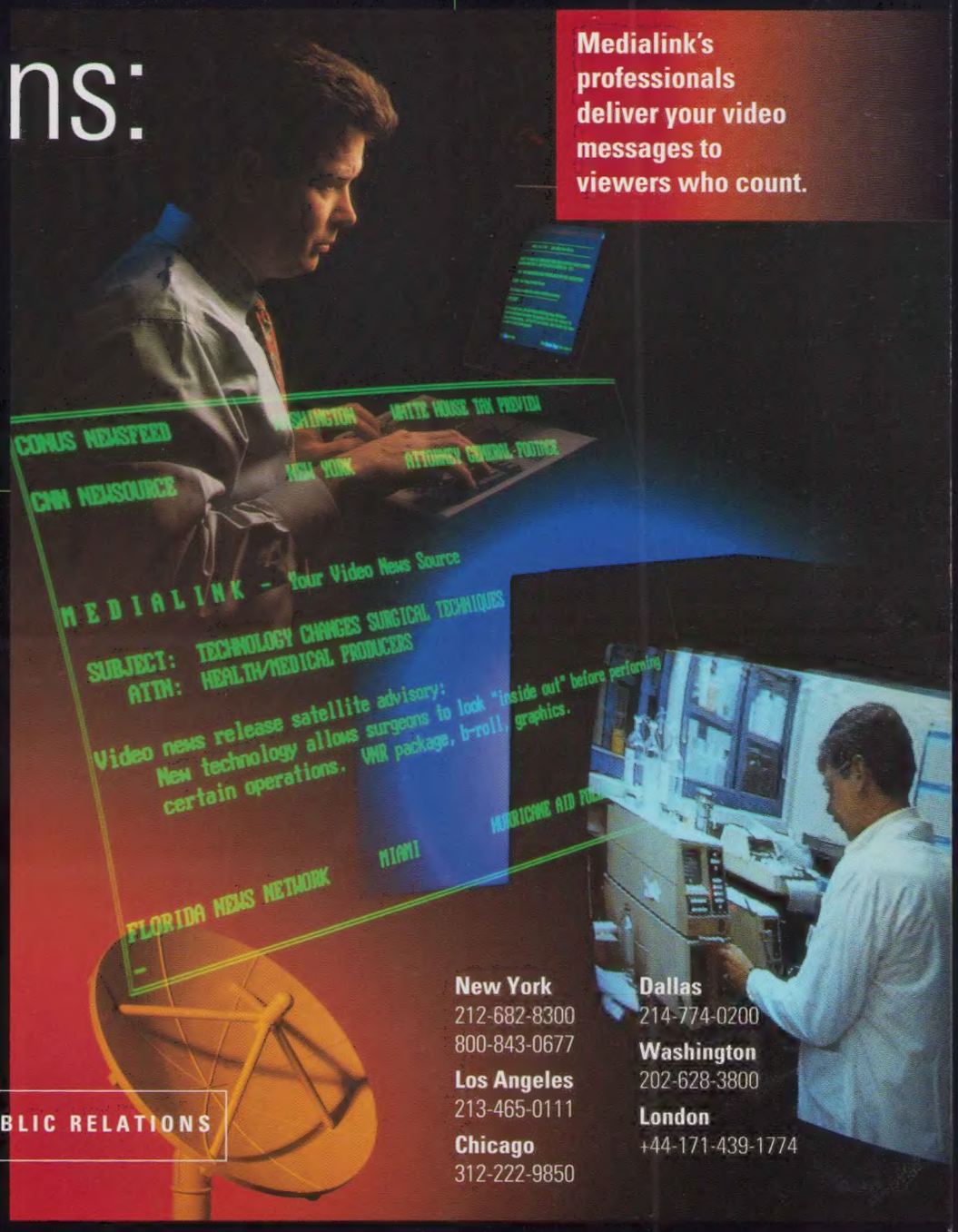

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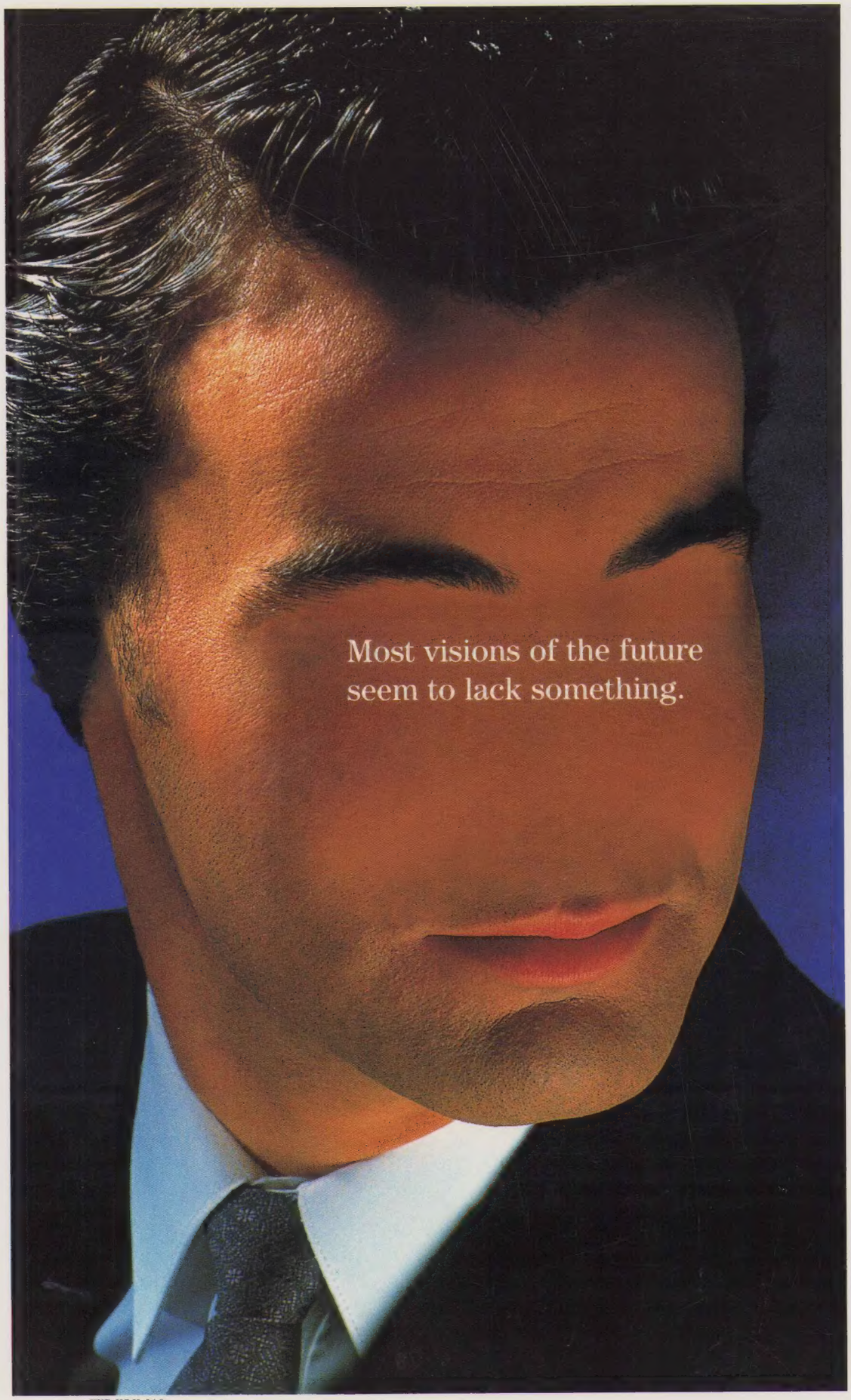

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